

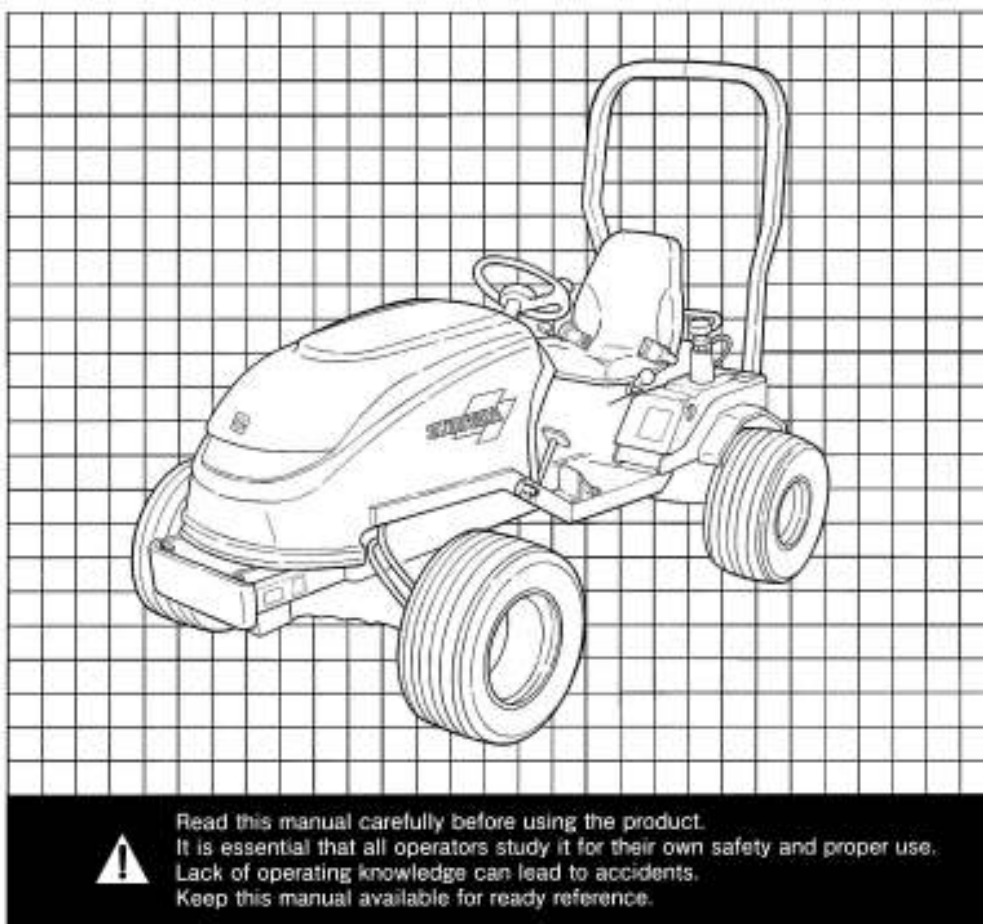
SHIBAURA

OPERATOR'S MANUAL

SLOPE MOWER

MODEL

SG280E



Read this manual carefully before using the product.
It is essential that all operators study it for their own safety and proper use.
Lack of operating knowledge can lead to accidents.
Keep this manual available for ready reference.

TO THE OWNER:

This manual contains information concerning operation, adjust, and maintenance of the SG280 Mower. You have purchased a dependable machine, but only by proper care and operation you can expect to receive the performance and long service built into this Mower. Please have all operators read this manual carefully and keep the manual available for reference.

Your SHIBAURA dealer will instruct you in the general operation of your Mower. (Refer to the "Delivery Report" at the back of this manual.) Your dealer's staff of factory-trained service technicians will be glad to answer any questions that may arise regarding the operation of your Mower.

Your SHIBAURA dealer carries a complete line of genuine SHIBAURA parts. These parts are manufactured and carefully inspected to insure high quality and accurate fitting of any necessary replacement parts.

Keep this manual next to your machine, after you have read through it. If you lose or damage this manual, ask a new manual to SHIBAURA's dealer right away.



CAUTION: THIS SYMBOL IS USED THROUGHOUT THIS BOOK WHENEVER PERSONAL SAFETY IS INVOLVED. TAKE TIME TO READ AND FOLLOW THE INSTRUCTIONS. BE CAREFUL!

CAUTION: PICTURES IN THIS MANUAL MAY SHOW PROTECTIVE SHIELDING OPEN OR REMOVED TO BETTER ILLUSTRATE A PARTICULAR FEATURE OR ADJUSTMENT.

BE CERTAIN, HOWEVER, TO CLOSE OR REPLACE ALL SHIELDING BEFORE OPERATING THE MACHINE.

IMPROVEMENTS

IHI-SHIBAURA is continually striving to improve its products. We reserve the right to make improvements or changes when it becomes practical and possible to do so, without incurring any obligation to make changes or additions to the equipment sold previously.

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SECTION 1-SAFETY RULES

1. SAFETY RULES

Please pay particular attention to all boxed parts in the text which have the sign▲.

This sign warns you to be careful when carrying out certain functions.

▲DANGER:

Denotes immediate hazards which WILL result in severe personal injury or death.

▲WARNING:

Denotes a hazard or unsafe practice which COULD result in severe personal injury or death.

▲CAUTION:

Indicates important safety messages in this manual. When you see this symbol, carefully read the message that follows and be alert to the possibility of personal injury or death.

NOTE: Gives helpful information.

Labels attached to certain parts of the Slope Mower give important safety information.

Please read them carefully. Should a label detach itself or become illegible, contact your dealer for a replacement.

SAFETY INSTRUCTIONS

A) TRAINING

- 1) Read the instructions carefully. Be familiar with the controls and the proper use of the equipment. Learn how to stop the engine quickly.
- 2) Only use the Slope Mower for the purpose for which it was made, that is, the cutting of grass. Any use not specifically indicated in the instruction handbook can be dangerous and result in damage to the machine, and will also result in the annulling of the warranty and the manufacturer declining all responsibility.
- 3) Never allow children or people unfamiliar with these instructions to use Slope Mower. Local regulations may restrict the age of the operator.

- 4) Never use the Slope Mower.

- When people, especially children, or pets are nearby.
- If the operator has taken medicine or substances that can affect his ability to react and concentrate.

- 5) Keep in mind that the operator or user is responsible for accidents or hazards occurring to other people or their property.

- 6) Do not carry passengers.

- 7) The operator of a Slope Mower must carefully follow the driving instructions, particularly:

- The need for care and concentration when using Slope Mowers;
- That control of a Slope Mower sliding on a slope will not be regained by the application of the brake.

The main reasons for loss of control are:

- Insufficient wheel grip;
- Being driven too fast;
- Inadequate braking;
- The type of machine is unsuitable for its task;
- Lack of awareness of the effect of ground conditions, especially slopes;
- Incorrect hitching and load distribution.

- 8) The Slope Mower is equipped with a series of safety microswitches and devices which must never be removed, altered or tampered with. Removing these devices invalidates the warranty and the manufacture declines any responsibility.

B) PREPARATION

- 1) While mowing, always wear substantial footwear and long trousers. Do not operate the equipment when barefoot or wearing open sandals.

SAFETY RULES

- 2) Thoroughly inspect the area where the equipment is to be used and remove all objects which may be thrown by the machine (stones, sticks, metal wire, bones, etc.)
- 3) **WARNING:** Engine fuel is highly flammable:
 - Store fuel in containers specifically designed for this purpose.
 - Refuel using a funnel and outdoors only. Do not smoke while refuelling or whenever handling the fuel.
 - Add fuel before starting the engine. Never remove the cap of the fuel tank or add fuel while the engine is running or when the engine is hot.
 - If fuel is spilled, do not attempt to start the engine but move the machine away from the area of spillage and avoid creating any source of ignition until the fuel has evaporated and the fumes dispersed.
 - Tighten caps of all fuel tanks and containers securely.
- 4) Replace faulty silencers.
- 5) Use the step plates when getting on and off the machine to prevent falls. Keep steps and platform clear from mud and debris.
- 6) Always check overhead clearance, especially when transporting this machine.
- 5) Do not operate on slopes of more than 22°(40%) in basic configuration.
This machine will operate on more than 22°slopes. This is in conjunction with operator training, correct weight, correct maintenance of the machine and appropriate conditions.
- 6) Remember there is no such thing as a “safe” slope.
Travel on grass slopes requires particular care. To guard against overturning:
 - Do not stop or start suddenly when going up or downhill;
 - Always keep the machine in gear, especially when traveling downhill;
 - Machine speeds should be kept low on slopes and during tight turns;
 - Stay alert for humps and hollows and other hidden hazards;
 - Never mow across the face of the slope.
- 7) Stop the blades rotating before crossing surfaces other than grass. When moving the Mower away from the lawn disengage the blades and put the mower deck into the highest position.
- 8) Do not change the engine governor settings or overspeed the engine. Operating the engine at excessive speed can increase the hazard of personal injury.

C) OPERATION

- 1) Do not operate the engine in a confined space where dangerous carbon monoxide fumes can collect.
- 2) Mow only in daylight or good artificial light.
- 3) Avoid operating the equipment in wet grass, where feasible.
- 4) Before starting the engine, disengage the blades, shift into neutral and engage the parking brake.
- 9) Before leaving the operator's position:
 - Disengage the blades and lower the Mower-deck.
 - Shift into neutral and set the parking brake.
 - Stop the engine and remove the key.
- 10) Disengage blades, stop the engine and remove key:
 - Before carrying out any work beneath the cutting deck or unclogging the chute;

SAFETY RULES

- Before checking, cleaning or working on the Slope Mower;
 - After striking a foreign object. Inspect the Slope Mower for damage and make repairs before restarting and operating the Slope Mower;
 - If the Slope Mower starts to vibrate abnormally (immediately check and remove the cause of the vibration)
- 11) Disengage drive to blades when transporting or not in use. Disengage the blades and wait for them to stop before emptying the grasscatcher.
 - 12) Stop the engine and disengage blades:
 - Before refuelling.
 - Every time the grass-catcher is removed or replaced.
 - Before making height adjustment.
 - 13) Reduce the throttle setting during engine shut down and turn the fuel off at the conclusion of mowing, following the instructions in the handbook.
 - 14) Do not put hands or feet near or under rotating parts. Keep clear of the discharge opening at all times.
 - 15) Watch out for traffic when crossing or near roadways.
 - 16) When using any attachments, never direct discharge of material toward bystanders nor allow anyone near the machine while in operation.
 - 17) Do not park this machine on a steep incline.
 - 18) Do not wear loose clothing when operating the power take-off, or when close to rotating equipment.
 - 19) Keep the machine in the same travel speed when going downhill as used when going uphill. Do not coast or free wheel down hills.
 - 20) Watch where you are going especially at row ends, on roads, around trees and low hanging obstacles.
 - 21) Do not cross gravel roads with the PTO engaged.
 - 22) Look to the rear before and when reversing. You must disengage blades before shifting into reverse. Before reversing make sure the area behind you is clear of obstructions, holes and small children. Use extra caution when machine is equipped with a grass catcher.
 - 23) Do not tow this machine. Use a suitable truck or trailer when transporting on public roads.
 - 24) Before mounting or operating the mower deck, read and understand the mower deck manual.

D) MAINTENANCE AND STORAGE

- 1) Keep all nuts, bolts and screws tight to be sure the equipment is in safe working condition. Regular maintenance is essential for safety and for maintaining performance levels.
- 2) Never store the equipment with fuel in the tank inside a building where fumes may reach a flame or a spark or a source of extreme heat.
- 3) Allow the engine to cool before storing in an enclosed space.
- 4) To reduce the fire hazard, keep the engine, exhaust silencer, battery compartment and fuel storage area free of grass, leaves, or excessive grease. Always empty the grass-catcher and do not leave garden rubbish containers within a room.

SAFETY RULES

- 5) Check the deflector and grass-catcher frequently for wear and deterioration.
 - 6) For reasons of safety, do not use the equipment with worn or damaged parts.
Parts are to be replaced and not repaired.
Use genuine spare parts. Parts which are not of an equivalent quality can damage the equipment and could be dangerous for your safety.
 - 7) If the fuel tank has to be drained, this should be done outdoors and when the engine is cool.
 - 8) Wear strong work gloves when removing and reassembling the blades.
 - 9) Check the blades' balance after sharpening.
 - 10) Take care as the rotation of one blade can cause the other blade to turn.
 - 11) When the machine is to be parked, stored or left unattended, lower the mower deck.
 - 12) The ignition key must never be left inserted in the machine, or where children or persons not familiar to the machine may reach them.
Before any maintenance or repair, remove the ignition key.
 - 13) Conduct operation and inspection during daytime or under bright lighting.
 - 14) Stop engine before servicing ,adjusting , repairing this machine.
 - 15) Do not work under a raised attachment unless it is securely supported by a suitable hoist or floor jack and multiple jack stands.
 - 16) When you work under the machine, support it firmly with such a crane, hoist or rigid racks on a level place. If not It may cause severe accidents.
 - 17) Never perform service underneath the machine if it is not completely stable.
 - 18) Be careful of Hot Oil Under High pressure.
The hydraulic system for the implement operates under high pressure. When replenishing or draining hydraulic oil, be sure to first relieve the high pressure.
 - 19) Be sure to disconnect the (-) terminal of battery before servicing. If not short circuit may cause a fire.
 - 20) HANDLING BATTERY ELECTROLYTE
 - The battery electrolyte is diluted sulfuric acid and poisonous. Top up battery electrolyte in well ventilated area and wear eye protection and rubber gloves. Splashed solution can cause burning skin, clothes and blindness if it get into eyes.
 - 21) Do not modify or alter or permit anyone else to modify or alter this machine or any of its components and functions without first consulting SHIBAURA's Dealer.
- ### E) TRANSPORTING
- The method of loading & un-loading on the truck Please do the loading and unloading work on the flat & safety place.
- 1) Loading on the truck
 - Stop the truck engine and set the parking brake.
 - Put the hook of the ramps on the truck floor firmly so that the ramps will not come off.
 - Load the tractor vehicle into truck slowly by moving the vehicle forward. (* in case that the implement of installation is mower deck)
 - Load the tractor vehicle into truck by moving the vehicle forward on the ramps.

SAFETY RULES

- After the completion of loading, lower the implement. Then, stop the tractor engine and set the parking brake (for tractor).
 - Fix the tractor vehicle with a strong rope.
- 2) Unloading on the truck
- Please do the unloading work under the opposite procedure of loading
- 3) Warning
- Set the parking brake for truck.
 - Remove the mud from the tractor tires in order to prevent vehicle from slipping sideways on the ramps. There is a possible risk of fall of vehicle due to accidental movement of ramps during loading work.
 - Put the hook of the ramps on the truck floor firmly. There is a possible risk of fall of the vehicle due to accidental movement of the ramps during loading work.
 - Keep the even height between right and left ramps. There is a possible risk of fall of the vehicle due to accidental movement of the ramps during loading work.
 - Do not steer sharply on the ramps.
There is a risk of fall of the vehicle due to accidental movement of the ramps during loading work.
 - Pay attention to loading & un-loading in order not to lose the vehicle's balance when moving the vehicle on the gap (seam) between the ramps and truck floor.
Keep those works at slow speed. There is a possible risk of fall of the vehicle.
 - Fix the vehicle tire & bumper and drawbar hitch with a strong rope firmly. There is a possible risk of accidental movement of cargo during transportation.
- In case of using sunshades cover etc, please fix it with the ropes etc firmly. There is a possible risk of deformation or part detach or fall on the vehicle part, which tends to be affected by wind pressure.
 - Do the loading work slowly by moving the vehicle forward. If loading work is done by moving the vehicle backward, the vehicle's rear tire tends to float and as a result, there is a possible risk of fall of vehicle. However, in case that the rear visibility is not good due to the rear installation implement, please do the loading by moving the vehicle backward, considering the possible any difficulties and fall of vehicle on the unloading.
 - Assure that the height of the cargo will not be problem at the height restriction area to avoid danger to other traffic.

ENVIRONMENTALLY RESPONSIBLE

ALWAYS BE ENVIRONMENTALLY RESPONSIBLE

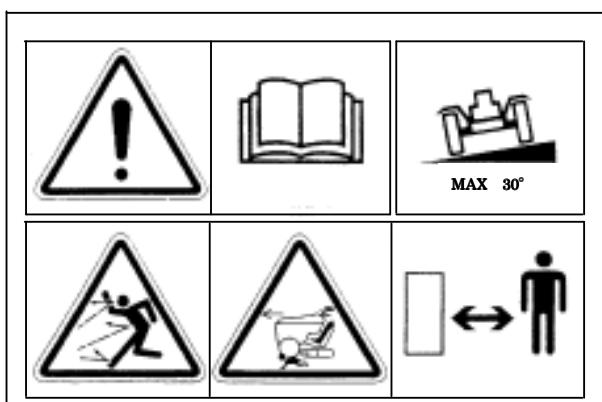
- Follow the guidelines of the government agency for the proper disposal of hazardous materials such as engine oil, diesel fuel, engine coolant and, machine fluid, grease.
- NEVER dispose of hazardous materials irresponsibly by dumping them into a sewer, on the ground, or into ground water or waterways.
- Failure to follow these procedures may seriously harm the environment.
- Comply with legal regulations and guidelines for disposal of empty containers for fuel, cooling water (coolant), oil, grease; fuel/oil filters; batteries; machine itself; machine accessories; and packaging materials.

SAFETY AND INSTRUCTION DECALS

Your Slope-mower must be used with care. Therefore, decals have been placed on the machine, to remind you pictorially of main precautions to take during use. Their meaning is explained below.

We also strongly recommend to carefully read the safety instructions given in the concerned chapter of this manual.

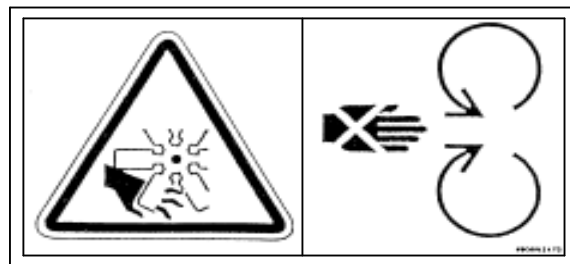
SAFETY DECALS



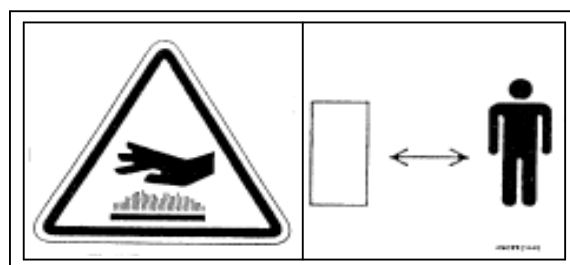
- Read this Operator's Manual before using the Slope-mower.
- Keep other people at a distance while using.
- Make sure that children stay clear of the machine all time when engine is running.
- Do not use this machine on slopes greater than 30°. Specialist training is recommended.



- Batteries produce explosive gas. Keep sparks and flames away.
- Battery contains sulfuric acid. Wear protective clothing and use eye protection.



- Never touch rotating parts while engine is running.



- Stay clear of hot surface.

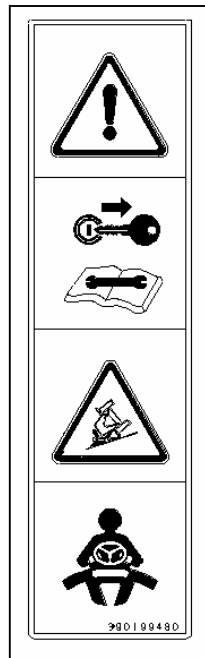


- Use diesel fuel.
- Diesel fuel is flammable.
- Add diesel fuel before starting the engine.
- Never remove the fuel tank cap or add diesel fuel while the engine is running or when the engine is hot.
- Refuel outdoors only and do not smoke while refuelling.

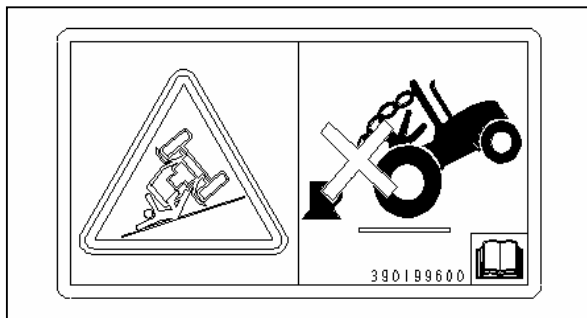
SAFETY AND INSTRUCTION DECALS



- Do not open when hot.
- Contents under pressure.

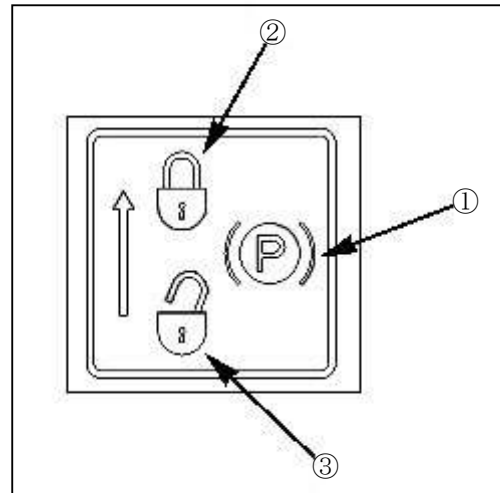


- Always wear seat belt.



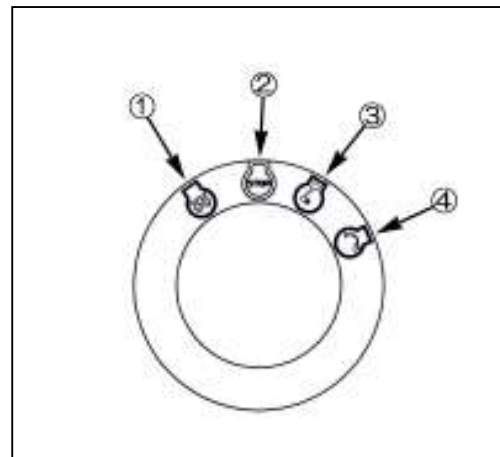
- Do not attach ropes or chains to ROPS for pulling purposes.
- Use of ROPS and seat belt reduce the chance of injury or death if rollover or upset occurs.

INSTRUCTION DECALS



Parking Brake

- ① Parking Brake
- ② "Lock" Position
- ③ "Release" Position



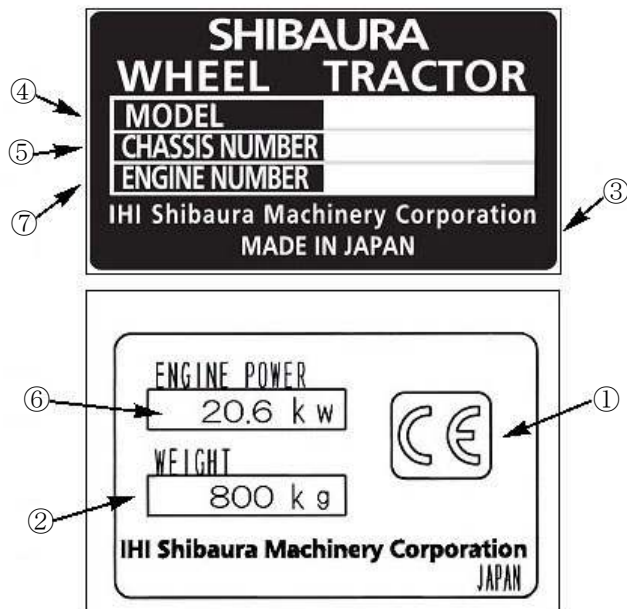
Key Switch

- ① Engine "HEAT" Position
- ② Engine "STOP" or "OFF" Position
- ③ Engine "ON" Position
- ④ Engine "START" Position

SECTION 2-GENERAL INFORMATION

MACHINE IDENTIFICATION PLATE

- ① CE Conformity Mark
- ② Weight in kgs
- ③ Name and Address of Manufacturer
- ④ Type of Front Mower
- ⑤ Serial Number
- ⑥ Engine Power
- ⑦ Engine Number



PLEASE READ CAREFULLY:

For a complete list of the pre-delivery service checks performed by your dealer, refer to the PRE-DELIVERY SERVICE checklist found at the back of this manual. Keep one copy as your record of the service performed. The other copy should be removed from the manual and kept by your dealer. MAKE SURE THAT BOTH COPIES ARE COMPLETED AND THAT YOU AND THE DEALER SIGN BOTH COPIES.

A PRODUCT IDENTIFICATION PLATE is located in the front frame of the mower.

The numbers on the plate are important in the event your mower should require future service. For your convenience, have your dealer record these numbers in the appropriate spaces below.

IHI Shibaura Machinery Corporation is continually striving to improve its products. We reserve the right to change prices, specification, or equipment at any time without notice.

All data given in this book is subject to production variations. Dimensions and weights are approximate only, and the illustrations do not necessarily depict Mower in standard condition. For exact information about any particular Mower, please consult your SHIBAURA dealer.

This Mower has been designed for doing light work, such as mowing, blowing snow. Do not attempt to use implements that were not designed for this mower, as they may cause damage to the mower.

SHIBAURA	
WHEEL TRACTOR	
MODEL	
CHASSIS NUMBER	
ENGINE NUMBER	
IHI Shibaura Machinery Corporation	
MADE IN JAPAN	

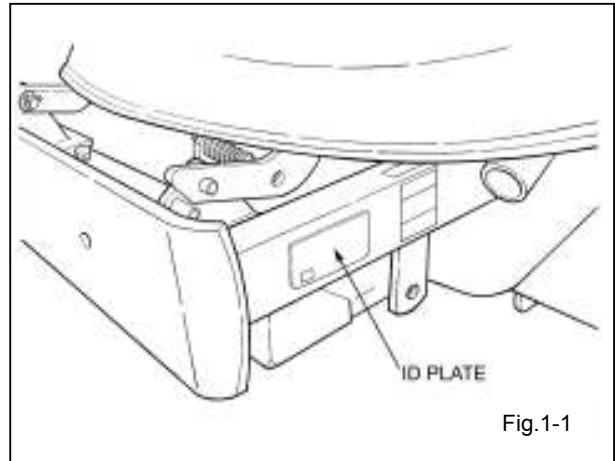


Fig.1-1

GENERAL INFORMATION

MINIMUM HARDWARE TIGHTENING TORQUES

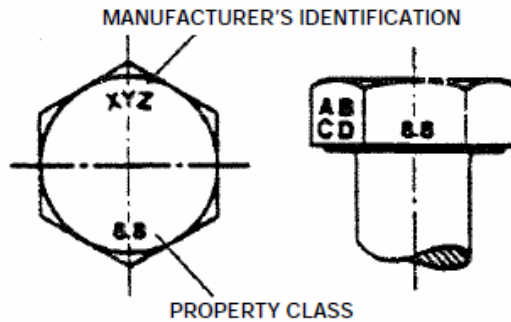
IN FOOT POUNDS (NEWTON-METERS) FOR NORMAL ASSEMBLY APPLICATIONS

METRIC HARDWARE AND LOCKNUTS

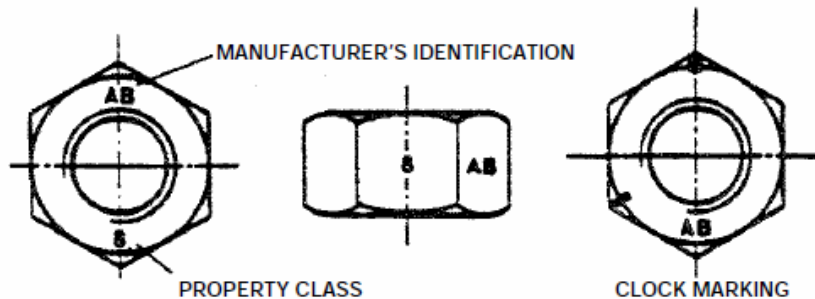
NOMINAL SIZE	CLASS 5.8		CLASS 8.8		CLASS 10.9		LOCKNUT CL.8 W/CL8.8 BOLT
	UNPLATED	PLATED W/ZnCr	UNPLATED	PLATED W/ZnCr	UNPLATED	PLATED W/ZnCr	
M4	15*(1.7)	19*(2.2)	23*(2.6)	30*(3.4)	33*(3.7)	42*(4.8)	16*(1.8)
M6	51*(5.8)	67*(7.6)	79*(8.9)	102*(12)	115*(13)	150*(17)	56*(6.3)
M8	124*(14)	159*(18)	195*(22)	248*(28)	274*(31)	354*(40)	133*(15)
M10	21 (28)	27 (36)	32 (43)	41 (56)	45 (61)	58 (79)	22 (30)
M12	36 (49)	46 (63)	55 (75)	72 (97)	79 (107)	102 (138)	39 (53)
M16	89 (121)	117 (158)	137 (186)	177 (240)	196 (266)	254 (344)	97 (131)
M20	175 (237)	226 (307)	277 (375)	358 (485)	383 (519)	495 (671)	195 (265)
M24	303 (411)	392 (531)	478 (648)	619 (839)	662 (897)	855 (1160)	338 (458)

NOTE: Torque values shown with * are inch pounds.

IDENTIFICATION HEX DCAP SCREW AND CARRIAGE BOLTS CLASSES 5.6 AND UP



HEX NUTS AND LOCKNUTS CLASSES 05 AND UP



GENERAL INFORMATION

INTERNATIONAL SYMBOLS

As a guide to the operation of your tractor, various international symbols have been used on instruments and controls. These symbols are depicted and described below.

	Hours Recorded		Battery		Power Take-off (ON)
	Engine Water Temperature		Glow		Power Take-off (OFF)
	Air Filter		Engine Stop		"Tortoise"-SLOW or Minimum Setting
	Engine Oil		Engine run		"Hare"-FAST or Maximum Setting
	Engine Oil Pressure		Engine Start		Warning
	Hydraulic Oil		Parking Brake		Control Lever Hold
	Diesel Fuel		Lock		Rock Shaft (Raised)
	Read Operator's manual		Release Lock		Rock Shaft (Lowered)

SECTION 3-NAME OF EACH PART

1. Vehicle

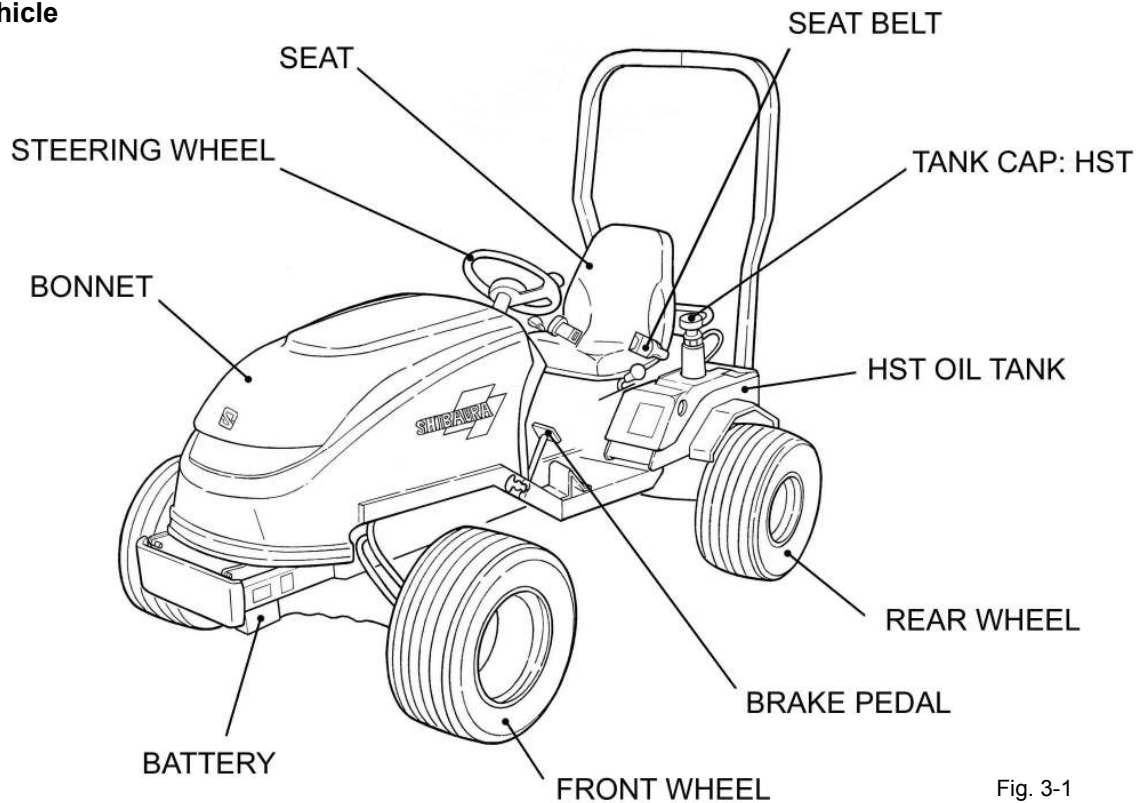


Fig. 3-1

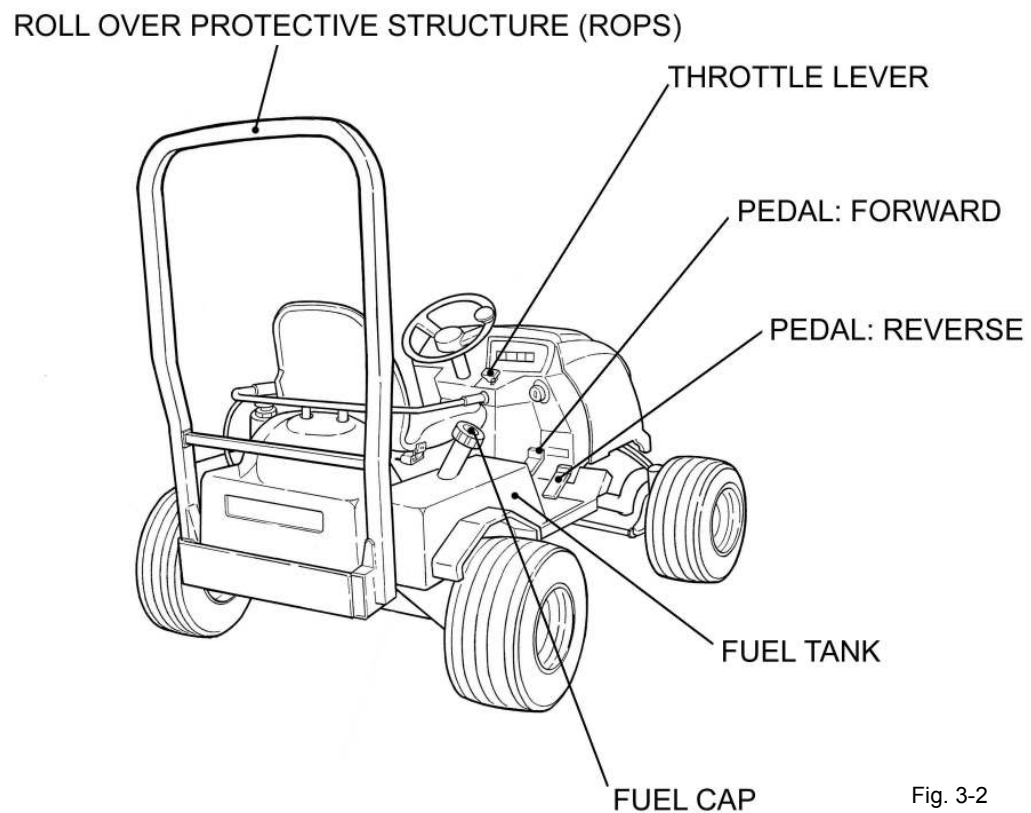


Fig. 3-2

2. Operation System

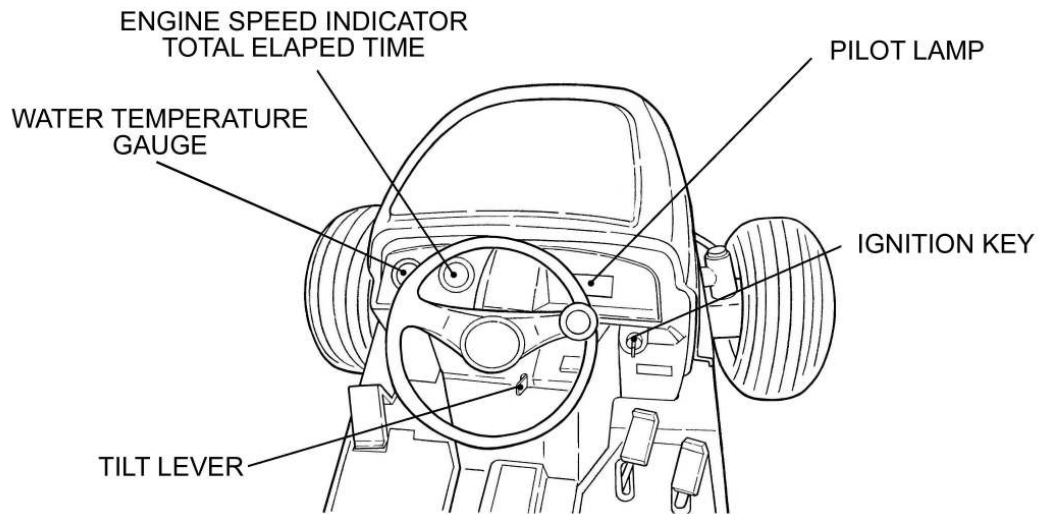


Fig. 3-3

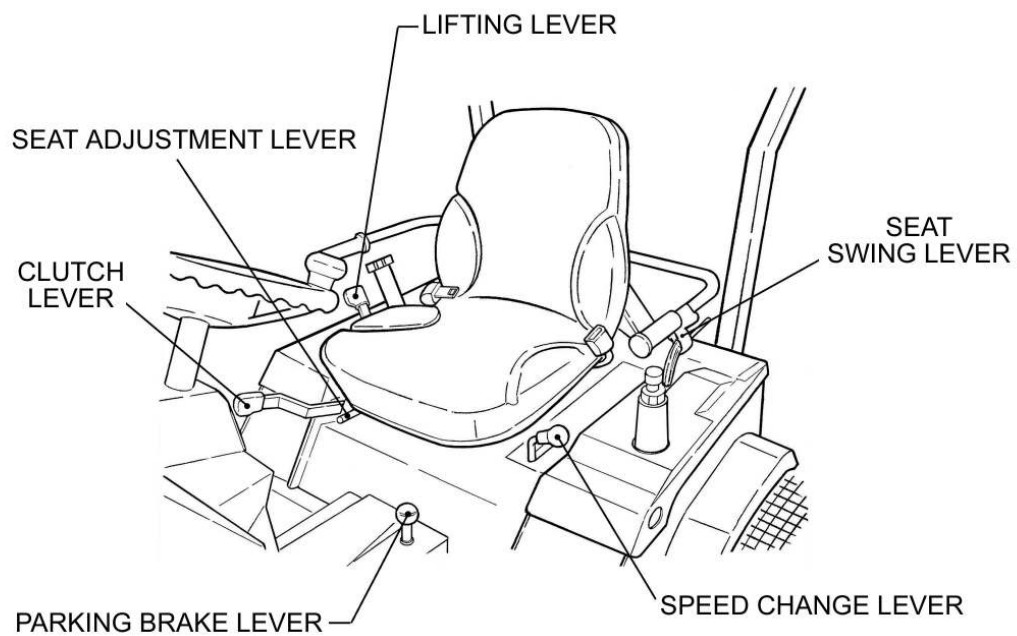
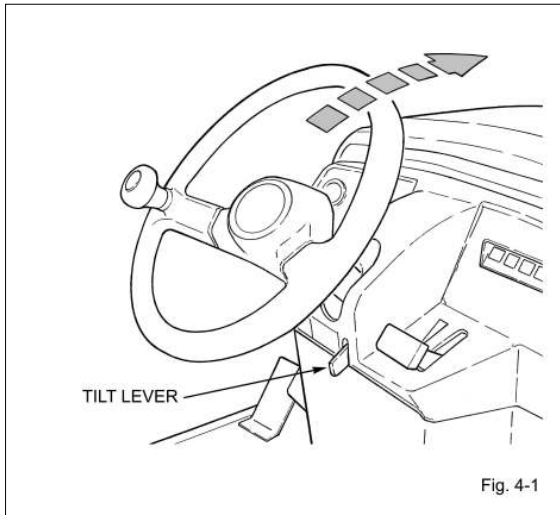


Fig. 3-4

SECTION 4-FUNCTION OF EACH PART

1. Steering Wheel and Seat Systems

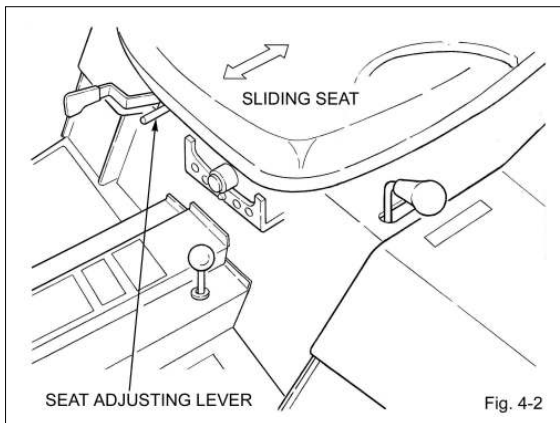
① Steering wheel



Angle of the steering wheel can be adjusted. Position of the steering wheel can be adjusted by pulling the tilt lever.

After the position is determined, pull down the tilt lever forward and fix. Do not adjust these functions while the vehicle is traveling.

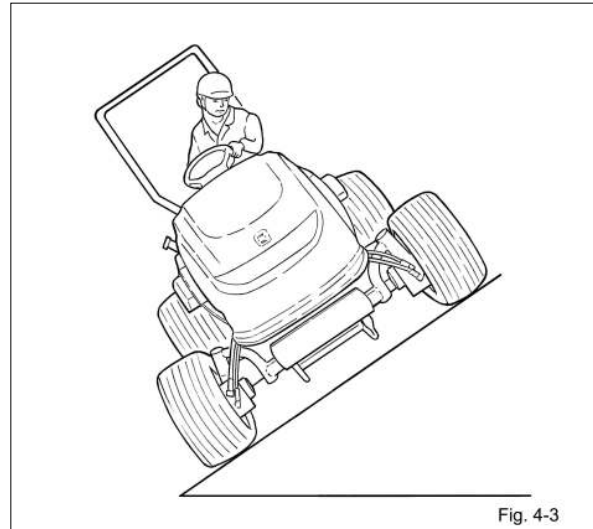
② Front / back seat adjustment



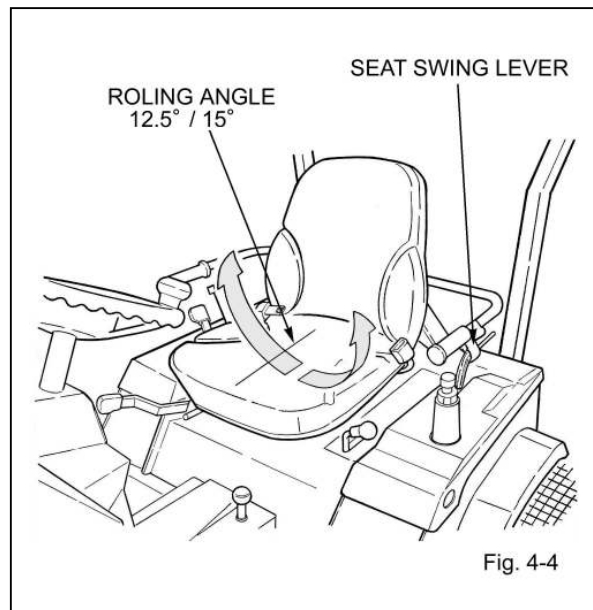
The seat slides forward and backward. Release the seat by movement of the lever. Adjust the seat properly to your operating position.

③ Rolling seat

Seat angle can be adjusted when you operate on a slopes.



By grasping the seat swing lever above the oil tank, the seat rolls laterally in 2 steps to 12.5 and 15°. Continuous operation along the slope allows safe operation at a comfortable position.



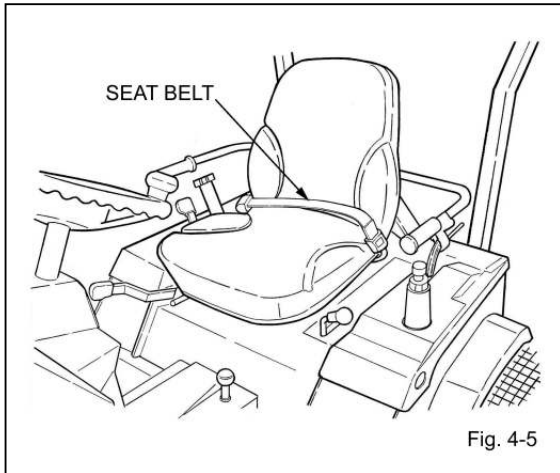
FUNCTION OF EACH PART

④ Seat belt (ROPS)

DO NOT ATTEMPT BYPASS SEAT SAFETY INTERLOCK SWITCH.

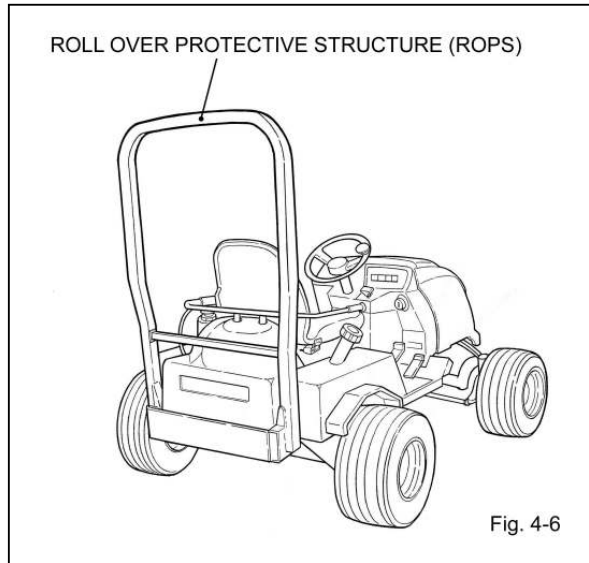
Seat Belt

- When driving the vehicle, always fasten the seat belt.
- Fasten the seat belt extending over the hips. If the seat belt is not applied, death or serious injury may be caused in the event of roll over, tumbling, rear end collision or other accidents.



ROLL OVER PROTECTIVE STRUCTURE (ROPS)

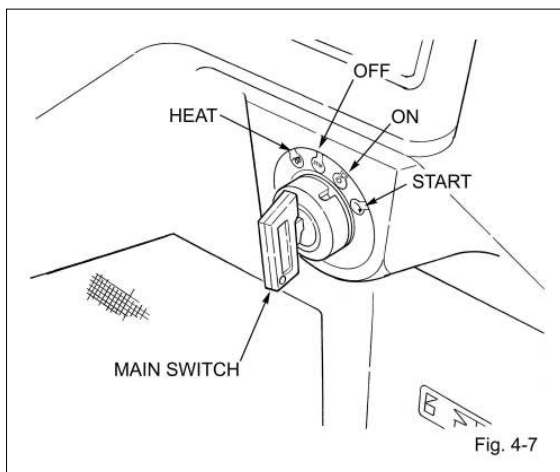
Roll Over Protective Structure (ROPS) and seat belts are standard equipment.



- DO NOT remove a ROPS and seat belts. ROPS when used with seat belts is effective in reducing injuries during unit overturn accidents.
- Over turning the unit without a ROPS can result in serious injury or death.
- ROPS is used to reduce damages of accidents in the event of roll over of the vehicle and not to prevent the roll over.
- Do not drive the vehicle with the safety frame removed.
- Do not modify the safety frame. If modified, it does not function as a safety frame.
- If ROPS is damaged or bent so that its strength is influenced, replace the safety frame. If it is repaired, it may not function as ROPS.

2. Engine Control System

① Main switch



Caution

- While the machine is not in service, be sure to pull out the key and store it in a safe storage place.

If not, some accident may be caused.

The key is used to start the engine.

[HEAT] If you release your hand from the key at the position to preheat the combustion chamber, the key will automatically return to the "OFF" position.

[OFF] Engine stops at this position and the key may be inserted or removed.

[ON] Key stays at this position while the engine is running.

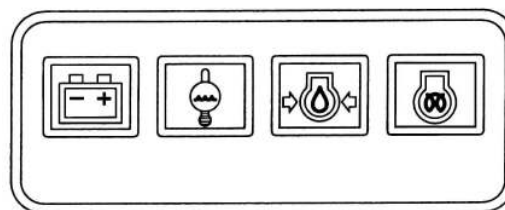
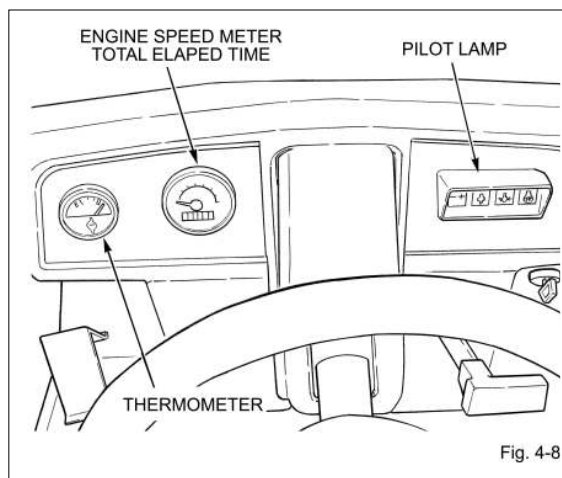
[START] Position to start the engine. When you release your hand from the key, it automatically returns to the "ON" position.

The vehicle is equipped with 4 safety switches to start the engine safely.

The safety switch functions to start the engine only when the following 4 conditions are met:.

1. Operator takes is seated.
2. He presses the brake pedal.
3. He turns OFF the PTO clutch.
4. He releases his foot from the running pedal.

② Meters and Pilot Lamp



PILOT LAMP

Fig. 4-9

- Charge lamp

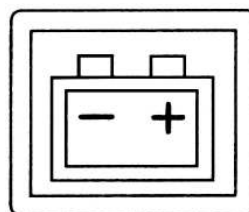


Fig. 4-10

When the main switch is turned to the "ON" position, the lamp lights up. After the engine starts, number of engine revolutions increases. When charging is started, the lamp goes out.

- Engine water temperature warning lamp

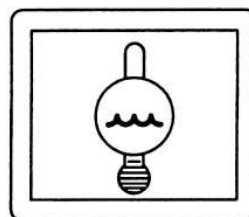


Fig. 4-11

Even though the main switch is turned to the "ON" position, the lamp does not light up. The lamp lights up if the engine is overheated during operation. In such a case, stop the operation and check the cause.

FUNCTION OF EACH PART

- Engine oil pressure pilot lamp

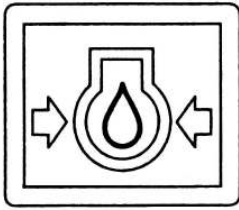


Fig. 4-12

When the main switch is turned to the "ON" position, the lamp lights up.

When the engine starts operation, the lamp goes out. If the lamp lights up while the engine is rotating, there is a fault in the lubrication pressure circuit.

Stop the engine immediately and check for the trouble.

- Glow lamp

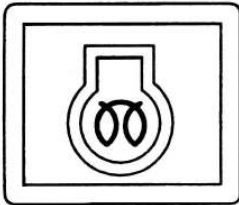


Fig. 4-13

By setting the main switch to the "Glow" position, the lamp lights up indicating that the power is supplied to the heater. Keep the switch at the "Glow" position for about 5 seconds and then turn it to the "START" position to start the engine.

- Water temperature meter

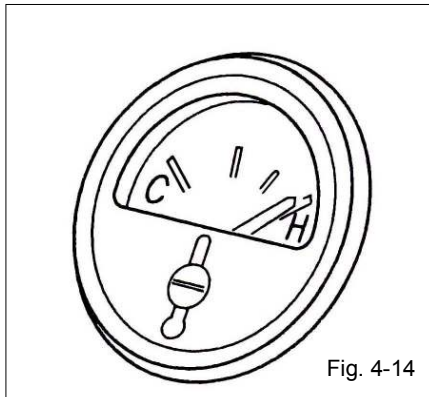


Fig. 4-14

Temperature of cooling water is indicated by a pointer during operation.

When the pointer points to the "H" position, engine may be overheated. Stop operation even when the engine water temperature meter lamp does not light up and check for the cause.

- Engine rev. counter / elapsed time integrator

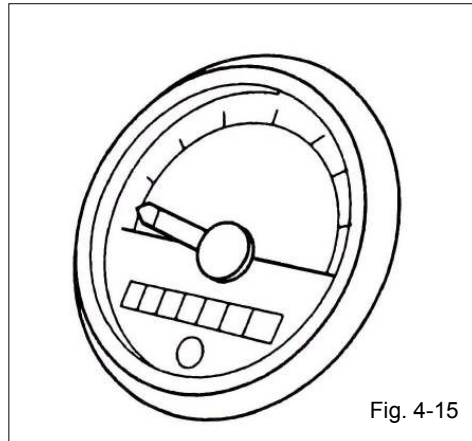


Fig. 4-15

While the engine is running, its number of revolutions is indicated by the pointer. The elapsed time integrator indicates the time by a number for which the machine was operated. By multiplying the white number on the right by 6, time in the minute unit is obtained.

③ Accelerator lever

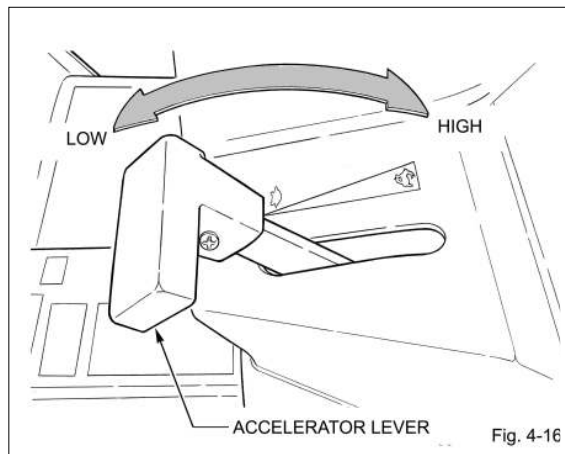


Fig. 4-16

The accelerator lever is used to increase or decrease the engine revolutions.

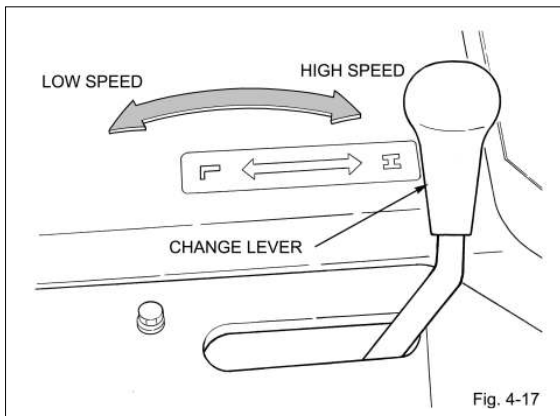
By pulling the lever toward the operator, the engine revolutions decrease and by pushing it forward, the engine revolutions increase.

FUNCTION OF EACH PART

3. Traveling and Mower Clutch System

① Gear shift lever

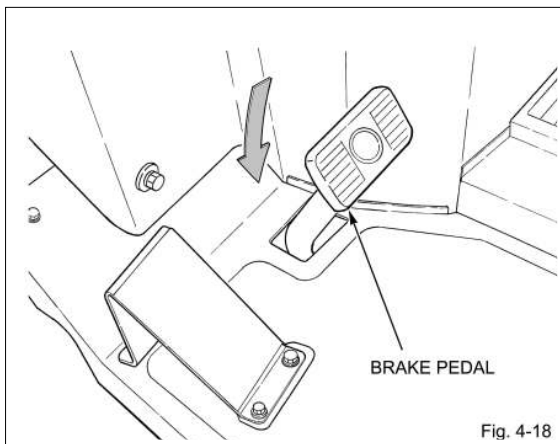
Used to change the traveling speed.



Vehicle speed can be selected from “L” (low speed) (4 WD) and “H” (high speed) (2 WD). By pushing the lever forward, the speed increases and by pushing it rearward, the speed decreases. Keep the lever on the low speed side for usual operation and use the high speed side only when traveling. When changing the speed, stop the vehicle.

② Brake pedal

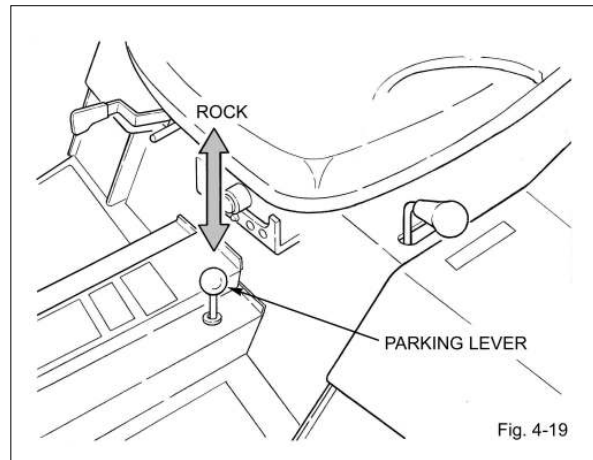
Used to stop the vehicle.



By pressing the brake pedal, brake is applied. A safe starting device is provided. Be sure to press the brake pedal when starting the engine.

③ Parking brake lever

Used to park the vehicle.



By pressing the brake pedal fully and pulling up the lever, the parking brake is applied.

To release the brake, press the brake pedal and release the brake pedal while pushing down the lever.



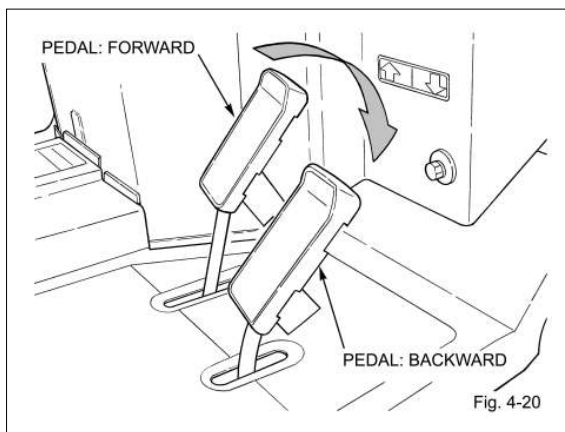
Warning

- When warming up the vehicle, be sure to apply the parking brake.

FUNCTION OF EACH PART

④ Forward/reverse pedal

Pedal to travel the vehicle.



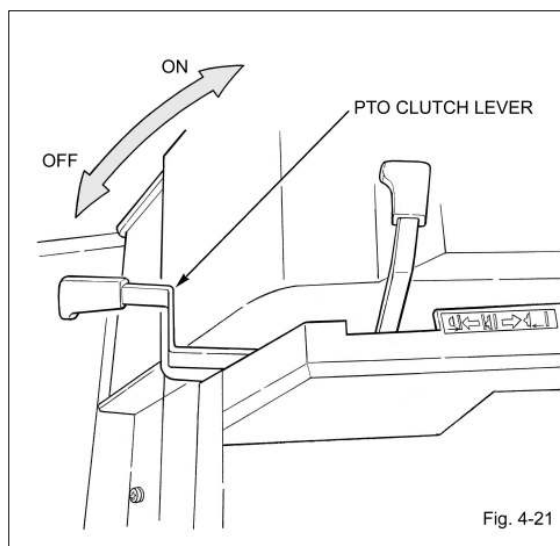
Press forward pedal down to drive the vehicle forward and the reverse pedal to reverse it. No clutch pedal is provided on this machine. Speed is increased or decreased by the amount the pedal is depressed.

Speed of the vehicle when starting to travel varies depending on the traveling pedal pressing degree. When starting the vehicle, press down the pedal gradually and slowly. By releasing your foot from the pedal on a flat ground, the pedal automatically returns to the neutral position and the vehicle stops.

A start-up safety device is provided. When starting the engine, never press the pedal.

⑤ PTO clutch lever

Lever to engage to the mower and rotate the blades.



By moving the PTO clutch lever to "ON", the blades rotate. By moving the PTO clutch lever to "OFF", the clutch is disengaged and the blade stops rotating.

The PTO clutch lever tensions the belt. When engaging the clutch, move the lever slowly to "ON". A safe starting device is provided. Always start the engine at the "OFF" position.



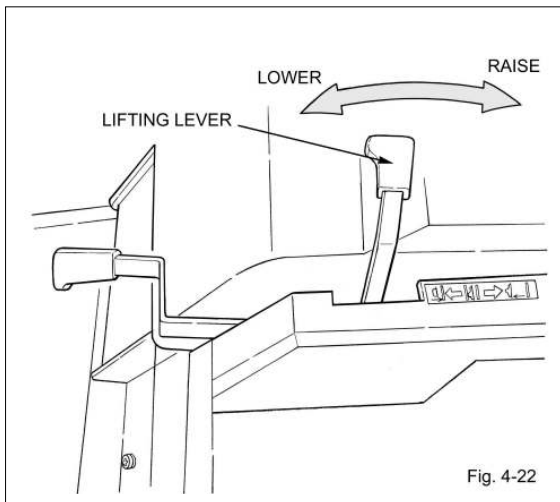
Warning

Always keep the clutch lever at the "OFF" position except during the operation. Do not travel with the blade rotating as pebbles or some other objects may be thrown into the surrounding area and are dangerous. When the PTO clutch lever is turned to the "OFF" position, the PTO does not stop immediately. It takes some time to stop. Do not put your hand or other objects into the mower inside until the rotation stops completely.

4. Hydraulic System

① Mid mower lifting lever

Used to lift or lower the mower.



By pushing down the lever rearward, the mower rises. When you release your hand from the lever, it automatically returns to the neutral position. By setting the lever to the lowering position, the lever is held at the lowered position and the mower becomes free to float over undulating ground.

SECTION 5-CHECK BEFORE OPERATION



Danger

- Always stop the engine and apply the parking brake before starting inspections, services or adjustment.
- While the engine is running or hot, never top up the oil as you may be burnt.
- Do not hold a cigarette in your mouth or use a naked flame when supplying fuel. After refueling, tighten the fuel cap firmly and wipe away spilled fuel. Ignoring this caution may lead to a fire.
- If the fuel pipe is damaged, fuel may leak. Be sure to check damages of the fuel pipe. If not, a fire may be caused.



Warning

- To secure safe and comfortable working conditions, the operator of this machine should perform the start-up inspection every day. Defects should be immediately repaired. Check also after shut down to find any abnormalities.
- Carry out inspections and maintenance services in a flat and stable place where there is no traffic danger or the machine may not fall over or move when using a jack. If these precautions are not observed, the machine may fall over or other accident may happen.
- If you should perform start-up inspections and services with the engine running, avoid a closed space.
- During the start-up inspections, keep any persons (particularly children) away from the workplace.



Caution

- Carry out inspections and services after the heated muffler, engine and other parts have completely cooled down. If not, you may be burnt.
- When removing covers or other components for inspections or services, always reinstall them. If not, you may touch a running part of the machine and you will be injured.

1. Physical Condition and Clothes of Worker

① Physical condition

When doing inspections or services, you should be in good health. If you cannot concentrate your attention on your work due to fatigue, sickness, drug influence or other, you should not work on the machine. In particular any person who is under the influence of alcohol, pregnant or under 18 years old should not work on, or with the machine.

② Clothes

- You should avoid so loose clothes that you may be caught by the operation levers or machine parts.
- You should wear protective shoes with slip-resistant shoes.
- Wear a helmet.
- Wear protective glasses, mask, gloves, and other protective apparatus as required.

CHECK BEFORE OPERATION

2. Inspection Method

Users of this machine should perform start-up inspection before starting operation every day to ensure safe and comfortable operation, according to the procedure below. Correct extraordinary conditions, if any, immediately. If any problems are felt during operation, inspect and repair without delay.

① Go around the machine to see:	Reference page
• Air pressure, wear and damage of tires	47
• Looseness of bolts fixing the wheels	47
• Fuel level, fuel leakage, damage of fuel pipe	38
• Level in the oil tank, contamination or leakage of oil	39
• Battery electrolyte level	43
• Deformation, damage or stain of each part	
• Damage of various parts of vehicle body, looseness of bolts	

② Open the bonnet to see:	Reference page
• Level and contamination of engine oil, fuel leakage	38, 40
• Level of cooling water, water leakage, damage of hose	42
• Condition of the air cleaner	43
• Insufficient tension or damage of cooling fan belt	45
• Dust or grass on the radiator grill or in the engine area	46
• Condition of wiring loom and sheathing, loose connections	

③ Sit on the driver's seat and check:	Reference page
• Brake operating condition	47
• Traveling pedal operating condition	21
• Allowance of steering wheel	31

④ Start the engine and check:	Reference page
• Colour of exhaust gas	47
• Operation of lamps and meters	18, 19
• Noise or vibration after the engine is started	

SECTION 6-DRIVING AND WORK

1. Break-in Operation (first 50 hours)

Handling of a new vehicle in the initial 50 hours is very important.

Break-in operation greatly influences the life and performance of machines. Handle the machine correctly paying attention to the following points particularly during this period.

- (1) Avoid quick starting and quick stopping.
- (2) Avoid higher speed or heavier load.
- (3) Drive the vehicle after the engine has been sufficiently warmed.
- (4) Drive slowly on rough roads or sloping lands.
- (5) When initial 50 hours have elapsed, perform the inspection of each part and change the oil according to "1. Periodical Inspection List" on page 36.

2. Starting and Stopping the Engine



Warning

- When starting the engine, sit down on the driver's seat and check the lever position and safety of surroundings. If not, injury accidents may be caused.
- Do not start the engine in a closed space. Start the engine outdoors. If you are required to start the engine in a room, ventilate the area sufficiently. If not, you may suffer poisoning of exhaust gas, which may lead to an accident involving death.



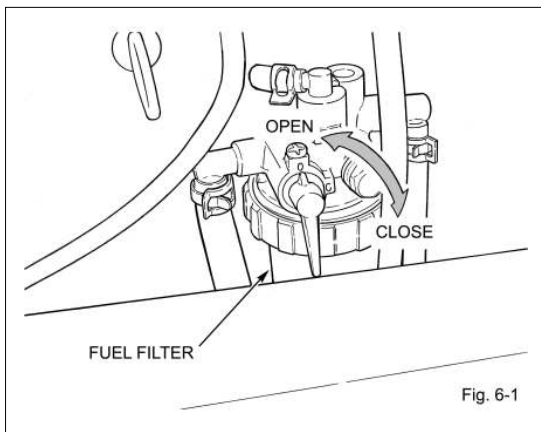
Caution

- Before and after the operation of the machine, always perform inspections and services. Particularly, take care of the brake, levers and other operating devices to ensure their positive operation. If not, injury accidents or machine failure may result.
- Apply the parking brake during the warming up operation. If not, the machine may start moving and cause an accident.

① Starting the engine

- The starter consumes large current. Never operate it continuously for more than 10 seconds. (If the engine is not started within 10 seconds, turn off the switch, wait for more than 1 minute and then repeat the starting procedure again.)
- Never turn the key switch to the “starting position” while the engine is running.

- (1) Pull up the bonnet cover.
- (2) Set the fuel strainer tap to the “O” (open) position.



- (3) Sit in the seat (seat switch is provided).
- (4) Set the accelerator lever between the “Idling” and “Highest speed” positions.
- (5) Turn the key switch to the “Glow” position (keep it there for about 5 seconds).
- (6) Press the brake pedal fully and turn the key switch to the “START” position.
- (7) When the engine is started, release the ignition key immediately.

[Reference]

- Because of the function of the safety switch, the starter motor rotates **only when**; you are seated, the mower clutch lever is at the “Off” position, and the brake pedal is fully depressed. The forward/reverse pedal is not pressed.
- (8) Decrease the engine speed down to about 1500 rpm with the accelerator lever and keep the warming up for about 5 minutes with no load.

[Reference:]

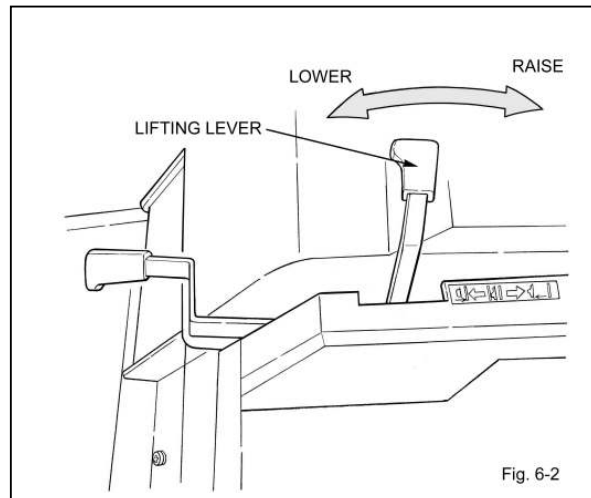
- This machine is hydraulically operated. If you do not carry out the warming-up operation, the hydraulic system may fail and may cause accidents. Particularly in cold areas, when the air temperature decreases and it grows colder, oil viscosity increases so that hydraulic operation may delay or normal pressure may not be obtained. To prevent such troubles, always carry out warming-up operation a little longer referring to the values in the table below.

Air temperature	Warming-up time
0°C -- -10°C	More than 10 minutes
-10°C -- -20°C	More than 20 minutes
Under -20°C	More than 30 minutes

② Stopping the Operation

- (1) Set the accelerator lever to the “Low speed operation” position and turn the key switch to the “OFF” position. The engine will stop.

3. Raising and Lowering the Mid Mower



When lifting or lowering the mid mower, push the lifting lever forwards to lower the mower, and push it to the rear to lift the mower. When you leave your hand from the lever, it automatically returns to the neutral position. When lowering the mower keep the lever in the forward position for 2-3 seconds after the mower is lowered. This allows the mower to float freely.

4. Starting, Turning and Stopping Method**Warning**

- When starting the vehicle, check for people around the vehicle, confirm safety in the surrounding areas and start the vehicle slowly avoiding an abrupt start. Failure to do this may result in injury or may cause accidents.
- During operation or when moving the vehicle, wear a helmet for safety.
- Do not allow anybody other than the driver to get on the vehicle.
- Do not start, turn or stop the vehicle abruptly or do not drive the vehicle too fast. Operate it slowly.

① Starting

- (1) Shift the gear shift lever to a desired position.
- (2) Lift the mower with the lifting lever.
- (3) Push down the parking brake pedal to release the parking brake.
- (4) By pressing forward or reverse pedal, the vehicle starts moving.

[Caution for Handling]

- Stop the vehicle before moving the gear lever. Operating the lever while the vehicle is moving may cause a failure.

② Turning**Warning**

- Before turning the vehicle, decrease the speed sufficiently. If the vehicle turns at a high speed, it may turn over and an injury accident may result.
- When making a turn, ascertain the ground condition before turning.

③ Stopping and Parking**Warning**

- When you leave the vehicle, park it on solid, flat and stable ground.
 - If you are required to park the vehicle on a slope, park the vehicle sideways and apply a chock to the front wheels.
- (1) Release your foot from the forward or reverse pedal and press the brake pedal.
 - (2) Lower the implement fully.
 - (3) Apply the parking brake.

**Warning****5. Work Operation**

- Remove obstacles in the area to be cut before commencing work. Obstacles may damage the mower and the vehicle, as well as the mower blade.
- Do not run the mower in raised condition. It is dangerous and may damage the mower body.
- Do not direct the discharge outlet to people. Grass or stones may be discharged and injure them.

① Caution for mower operation

- (1) If you operate a mower for the first time or are not familiar with machines, learn how to operate it on a flat place before commencing work.
- (2) Select a proper method of mowing operation according to the size or shape of the field, and arrangement of trees and other obstacles.
- (3) Height of grass varies depending on the type. Most grass is mowed to 51 to 76 mm high. Avoid mowing more than 1/3 of grass height to avoid damage of the grass.
If the turf grass is excessively tall, mow it to a little higher length and then to a desired height.
- (4) If the grass is thick, or in case of grass in the spring season or in a place of soft ground surface, the vehicle or mower wheel may settle into the ground so that the grass may be mowed too short. Check the height and adjust it when necessary.

② Operating the mower clutch lever

Power to the mower is turned ON or OFF with the mower clutch lever. By pulling up the lever, power is turned ON and the mower starts rotating. Keep the switch at this position during operation. By pushing down the switch forward, the power is turned OFF and the mower stops rotating.

[Caution for Handling]

- Before operating the mower clutch lever, pay attention to the surroundings and ascertain the safety.
- When starting the engine, set the mower clutch lever to the "OFF" position. If not, the safety device is activated and the engine does not start.

- If the engine revolving speed is too low, mower operation cannot be started. Operate the engine at full throttle for mowing.
- When the mower clutch lever is set to "OFF", the mower blades do not immediately stop. You should be careful while the mower is revolving.

③ Lawn mowing operation

For more efficient mowing operation, blade revolution should be always kept at the highest speed. By setting the accelerator lever of the vehicle to the highest revolution position, the blade highest speed and engine highest output can be obtained. Select the vehicle operating speed according to the turf condition, finish and skill of the operator. It is usually 3 to 6 km/h. You should operate the lawn mower in a gentle manner.

④ Lawn mowing on sloping land



Warning

- Do not operate the mower in a place where overturn or slip is feared. Vehicle may slip more easily particularly after rain, for instance. Do not operate the mower under such a condition.
- When working on a sloping ground, check for holes, rocks, roots of trees or other obstacles and check the entire land features in advance.
- On a sloping land, advance along contour lines and make a turn at a place of gentle angle of gradient.

To operate on slopes between 25 - 30 degrees operator training is required. Also the machine must be correctly maintained and must be used in appropriate conditions.

⑤ Discharge of grass**Warning**

- Grass clippings are forcefully discharged. For safety, keep the discharge outlet cover always in position.
- Do not direct the discharge outlet to people during operation.
- Before removing grass from the mower, be sure to stop the engine and wait for the blades to stop rotating.

This mower is designed to discharge grass after being cut evenly. When cutting tough, thick or tall grass, significant load is applied to the mower. Decrease the forward speed or mowing width in such a case.

[Caution for Handling]

Keep the mower main body and inside of the discharge outlet cover clean for smooth discharge.

⑥ Points of issues and solution

- Uneven mowing
Uncut turf remains in rows because of wear or deformation of the blade or too low engine speed. Check the blade for length, wear or deformation, or engine speed and operation speed.
- Separation of turf
Turf or ground is partially scraped off when the blade is too low. Check the blade height, for foreign substances entangled in the blades, blade installing condition, tyre pressures, etc. in such a case.
- Partial residue
If some grass remains uncut, check for too low engine speed, a build up of grass in the mower deck, too high running speed, and slip of clutch belt or mower belt.
- Wavy cutting
Difference of turf density or grass height, unevenness of ground surface, or other problems of the area to be cut may be the cause. Check that the mower gauge wheels are in contact with the ground, build up of grass in the cutter deck, wear or deformation of blade or traveling speed.
- Uneven mowing height
Cause is different mowing height between right and left sides. Check the mower gauge wheel for correct height of cut position, deformation of blade and blade shaft, blade installing direction, or even air pressure of right and left tires of the vehicle, in such a case.

6. Loading onto and Unloading from Truck



Warning

- When loading the vehicle onto or unloading from a truck, stop the truck engine, apply the hand brake to prevent the truck from moving and apply a chock to the vehicles wheel. Park on a flat place where the traffic is safe.
- Select loading ramps of enough width, length and strength and not slipping easily. Hitch a hook positively to the deck of the truck to prevent the loading ramps from getting out of place.
- When loading the vehicle onto a truck, drive the vehicle in reverse.
- Remove mud, etc. from the tire to prevent the vehicle from side slipping on the loading ramps.
- Never change the course on the loading ramps. If change of course is required, get down from the loading ramps and restart.

① Loading and Unloading with Ladders or Lamps

< Specifications for loading ramps>

- Length: … More than 3.5 times the height of the loading space of the truck
- Width: … More than 40 cm
- Strength: … Should withstand the weight of 2000 kg.
- Surface should have a non-slip surface.
- The loading ramps should not be laterally uneven in height. Install the walkway positively to the center of the loading space of the truck to ensure even right and left length.

<Loading>

- (1) Raise the implement to a height not to allow the implement to touch the loading ramps.
- (2) Position the implement straight to the loading ramps and load it slowly.
- (3) Operate the steering wheel carefully so not to allow the wheels from coming off the ramps.
- (4) After completion of loading, lower the cutter deck until it comes into contact with the bed of the vehicle, turn OFF the main switch and fix the vehicle firmly with ropes.

<Unloading>

- (1) Unload the vehicle in the reverse order to loading.

② Transportation method



Warning

- Fix the vehicle firmly with strong ropes. Lower the cutter deck until it comes into contact with the bed of the vehicle. If not, when the truck brakes suddenly, the mower may fall off the vehicle leading to an injury accident.



Caution

- When carrying the vehicle on the truck, fix the bonnet with a locking catch and lock pin to prevent it from opening. If not, the cover may be opened by wind, and cause an unexpected accident.

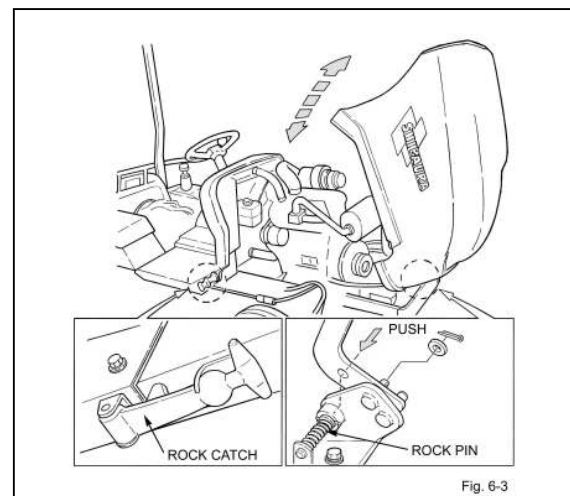


Fig. 6-3

7. Power Steering



Caution

- While the engine is running, the steering wheel can be operated very lightly. You should carefully operate the steering wheel when driving at a high speed. If not, an accident may be caused.

Power steering is active only when the engine is running. If the engine speed is low, the steering wheel may be a little heavier but this should not cause a problem in steering the vehicle.

[Care for Handling]

- When the steering wheel is turned fully, the relief valve is activated and a noise will be noted. If the noise sounds only for a short time, it may be ignored. However, do not continue driving if the noise continues.
- Turning the steering wheel while the vehicle is not moving accelerates damage of the tire or wheel rim. Do not turn the steering wheel if not required.

8. Front Weight

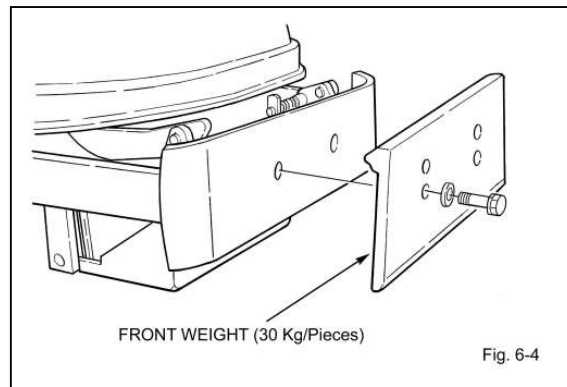


Caution

Optional front weight is available for this machine. When performing works on a steep slope, install the front weight.

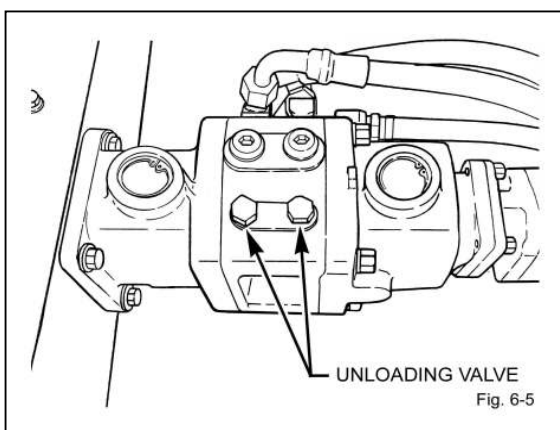
[Front Weight Installing Method]

- (1) Tighten a front weight of 30kg to the bumper.
- (2) Two more pieces of front weight may be added together and tightened if required.



9. Towing when self-propelled running is impossible

- If the vehicle becomes unable to be driven because of failure of the hydraulic system or for other reason, it is possible to move the vehicle by opening the hydraulic circuit so that the wheels can rotate and allow the vehicle to move.
- Loosen the unload valve to open the hydraulic circuit and allow the wheels to rotate freely. Loosen the 2 unload valves.
- Set up the vehicle as described below for the traction.



- (1) Stop the engine.
- (2) Change the shift lever to the "High Speed" position (2-wheel drive vehicle).
- (3) Loosen the unload valve under the seat.
Do not turn the valve more than one rotation.



Caution

- Do not turn the unload valve to loosen it more than one full rotation.
- Stop the engine when the vehicle is towed. To start the engine again, tighten the unload valve.

SECTION 7-MAINTENANCE AFTER THE WORK

1. Maintenance Services after Operation



Danger

- Before covering the vehicle with a sheet, stop the engine and wait for the engine and muffler to cool down completely.

After operation, wash the machine in water, wipe away the moisture completely, and apply grease to each grease nipple.



Caution

- Before starting inspections, maintenance services or repairs, be sure to stop the engine. If not, you may be caught by moving parts of the machine and injured.
- Start the inspections or maintenance services after heated parts of the muffler and engine have completely cooled down. If not, you may be burnt.

[Cautions for Handling]

- Avoid water from being splashed on electric parts as far as possible. If not, electric parts may be damaged.

2. Opening/closing the bonnet

- (1) Release the right and left bonnet catches.
- (2) While pushing the left lock pin in the bonnet front with a round rod, raise the bonnet. (Make sure that the bonnet lock is unlocked.)

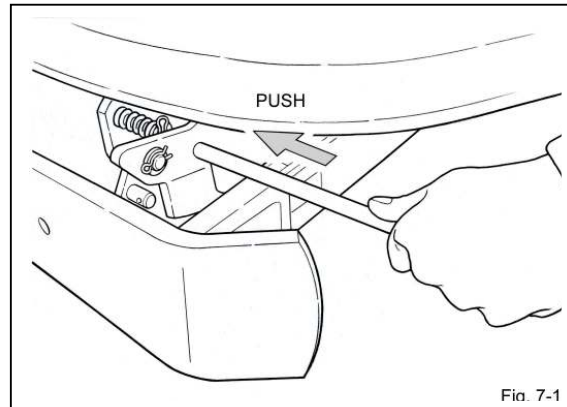


Fig. 7-1

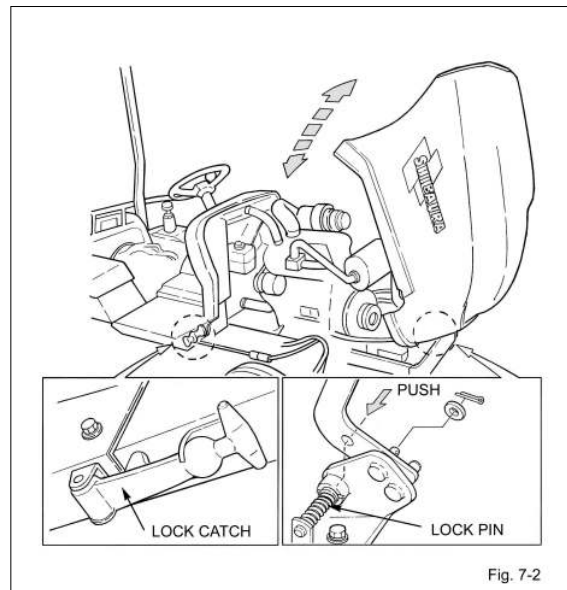
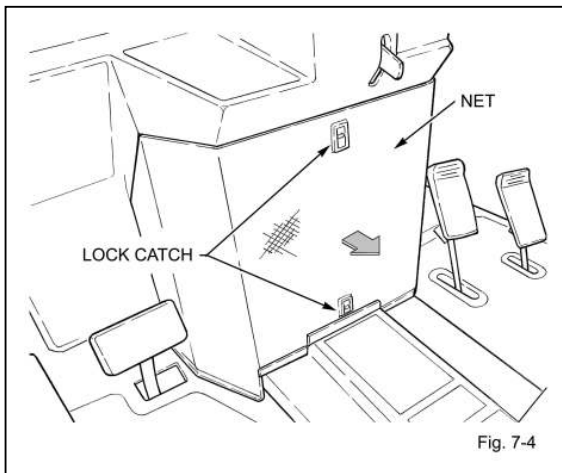
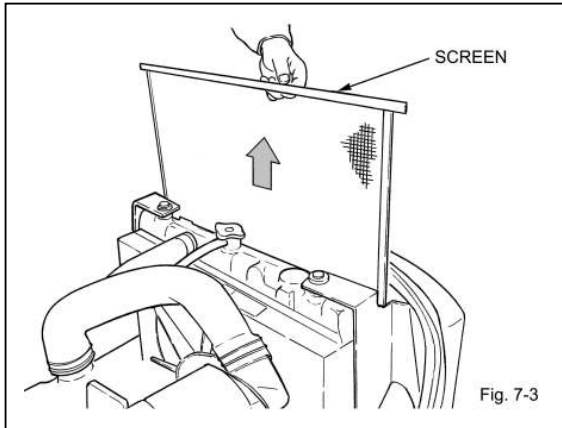


Fig. 7-2

- (3) Raise the bonnet until the bonnet supporting point is exceeded.
- (4) To close the bonnet, push it down.

3. Cleaning the Radiator

Grass attached to the dashboard or radiator screen may cause overheat. Before starting and after completing operation, always check and clean the screen and check it during operation depending on the operation conditions.



- (1) Open the bonnet.
- (2) Pull out the radiator screen upward and remove grass waste, dust, and other foreign substances attached to it.
- (3) If such foreign substances are attached to the radiator surface, clean the radiator taking care not to damage the fins.
- (4) The net can be removed and reinstalled without tools (by the lock catch at 2 points). Blow off the lawn grass and other foreign substances with air when cleaning the vehicle.

4. Services when not using for long time



Warning

- When storing the vehicle, remove the battery and pull out the key and store it. If not, an accident may be caused.

If the vehicle is not used for a long time (more than 1 month), service it as follows before storing it.

- (1) Lower the implement on a board in a dry and airy place.
- (2) Coat easy rusting place on the outside of the vehicle with rust inhibitor or engine oil or grease.
- (3) Fill the fuel tank fully with fuel. If the tank is kept empty, water drops will attach causing rust. Turn the fuel tap to the "C" (close) position.
- (4) Charge the battery fully. It is advisable to remove the battery from the vehicle and store it in an airy, cool and dark place. If the battery is kept on the vehicle and stored, be sure to disconnect the earth side (minus side).
- (5) Discharge the cooling water.
- (6) Pull out the key and store it in a place other than the vehicle.

[Caution for Handling]

- The battery is naturally discharged when not in use. Charge it fully with a charger once a month.

SECTION 8-INSPECTION AND MAINTENANCE



Warning

- Carry out inspections and maintenance services in a flat and stable place where there is no traffic danger or the machine may not fall over or move, applying a car lock. If these precautions are not observed, the machine may fall over or other accident may happen.



Caution

- Undergo semiannual inspections and services for the maintenance of each part. Replace the fuel pipe and power steering hose every 2 years. If not, ill-serviced vehicle may be subjected to accidents or machine failure.
- Be sure to stop the engine before starting inspections, services or repairs.
- If covers or other parts are removed for inspections or services, be sure to return them to the original position. If not, you may be entangled in the machine and injured.

[Reference]

Daily inspections and services ensure full performance of the machine and its safe and comfortable operation. To prevent accidents due to poor maintenance, undergo periodical inspections and services semiannually by a dealer to secure safety of each part.

INSPECTION AND MAINTENANCE

1. Periodical Inspection List

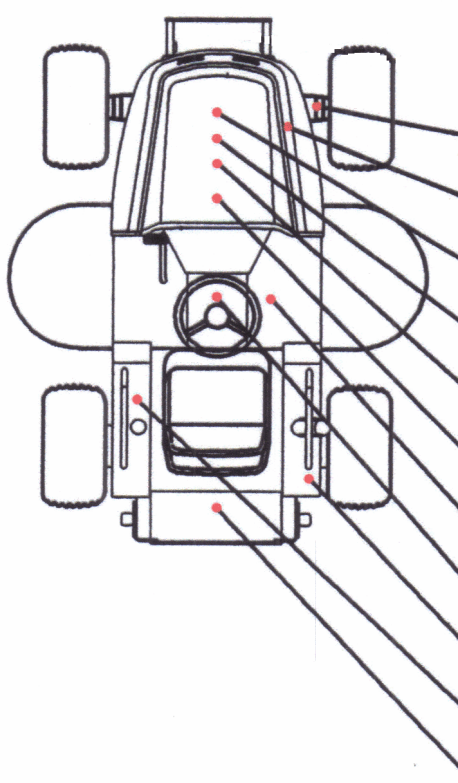
Vehicle		○Inspection ●Replacement											
Time on hour meter Item	50 hours	100 hours	150 hours	200 hours	250 hours	300 hours	350 hours	400 hours	450 hours	500 hours	550 hours	600 hours	Reference page
Engine oil	Inspect every 5 hours after the start of operation.												38
	●		●		●		●		●		●		
HST oil	○	○	○	○	○	●	○	○	○	○	○	●	39
Engine oil element	●				●				●				40
HST oil filter	●						●						40
Fuel filter (element)	Discharge the fuel from the filter every 50 hours and clean the filter every 100 hours.												41
	●				●				●				
Air cleaner element	Inspect every 10 hours and clean every 100 hours after the start of operation												43
Replacement of outer filter	After cleaning 6 times or once a year, whichever comes earlier.												43
Replacement of inner filter	Once per 3 times of outer filter cleaning or every 1000 hours, whichever comes earlier.												43
Cooling fan belt	○	○	○	Adjustment	○	○	○	Adjustment	○	○	○	Adjustment	45
Clutch belt		○		●		○		●		○		○	48
Battery electrolyte	Inspect every 25 hours.												43
Supply of grease	○	○	○	○	○	○	○	○	○	○	○	○	44
Radiator cooling water	Inspect every 10 hours after the start of operation (replace every year)												42
Cleaning of dust clogged in radiator	Clean every 10 hours from the start of operation.												34
Tyre air pressure	○	○	○	○	○	○	○	○	○	○	○	○	47
Wheel tightening torque	○				○				○				47

INSPECTION AND MAINTENANCE

2. Oil, Grease and Antifreeze Liquid

Fuel	(F)	Diesel light oil
Engine oil	(E.O.)	10W-30 (API class, CC and CD grade)
Mower gear oil	(G.O.)	SAE90
Hydraulic oil	(H.O.)	Shibaura HST oil (ISO VG46)
Cooling oil	(C)	Antifreeze liquid, Castrol LLC-95 (Mixing ratio of antifreeze liquid at the time of shipment is outside temperature – 30°C)
Grease	(C.G.)	All-purpose grease No.2

3. Oiling and Feed Water List

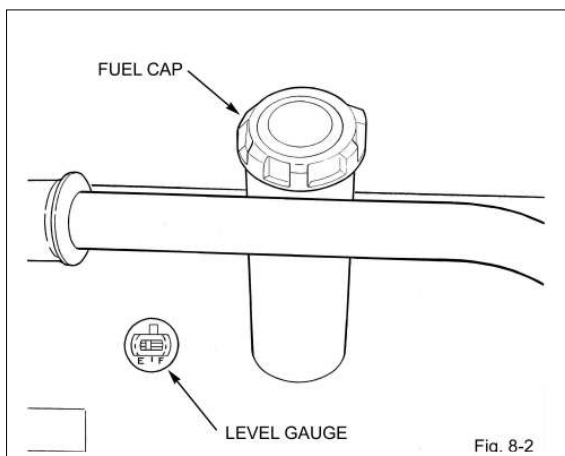


Oiling point	Oil type	Oil q'ty (L)	Check/oiling timing	Oil change timing	No. of oiling points
King pin	C.G	At need	50		2
Tie rod end					
Pivot shaft					
Steering cylinder					
Engine	E.O	3.5		100	1
Radiator	Water	4	Before the start of operation		
Mower shaft	C.G	At need	50		4
Mower gear box	G.O	0.4		200	1
Fuel tank	Light oil	26	Before the start of operation		
Oil tank	H.O	23	50	600	
Seat swing	C.G	At need			

4. Fuel Inspection and Oiling

Danger

- No smoking or naked flames when supplying fuel.
- After replenishing the fuel, tighten the fuel cap firmly and wipe away spilled fuel.
- Do not top up oil while the engine is running or hot. If not, a fire may be caused.
- Check the level of remaining fuel in the fuel tank on the level gauge. If the level is lower than specified, remove the fuel cap on the right side of the vehicle and replenish the fuel from the fuel filler cap.



[Caution for Handling]

- Too low fuel level may cause fuel shortage when the vehicle is traveling on a sloped ground. Supply fuel earlier.
- When the outside air temperature is under -10°C, use light oil of special No.3. Other oil may become too viscous and may not flow.

5. Check and Oil Exchange of Each Part

Danger

- Never top up the oil while the engine is running or hot. If not, a fire or burn injury may be caused.

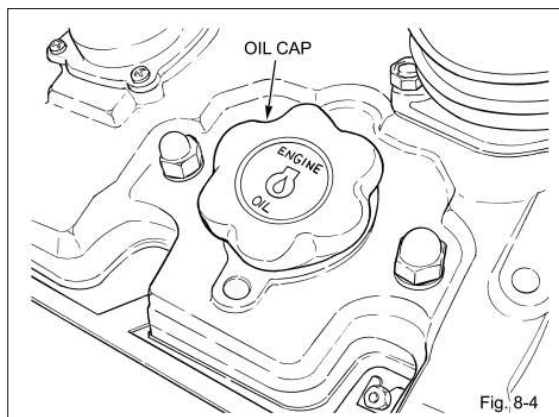
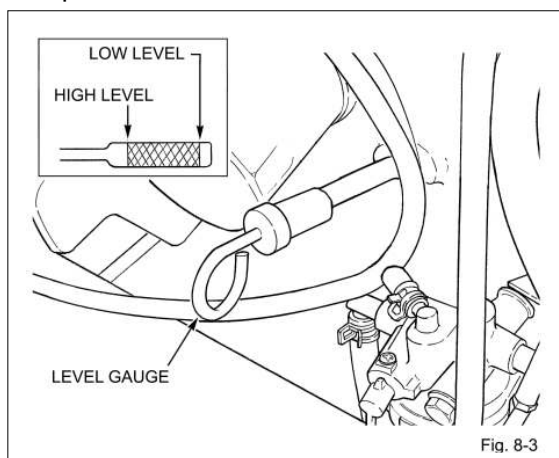
Caution

- Do not change the oil immediately after the engine stops. If not, a fire or burn injury may be caused.

① Engine Oil

Check

Pull out the oil dip stick, wipe the dip stick cleanly, insert it, pull it out again and check if the oil level is between the upper limit and lower limit on the gauge. If the oil is not enough, top up oil to the specified level on the dip stick from the oil filler port.

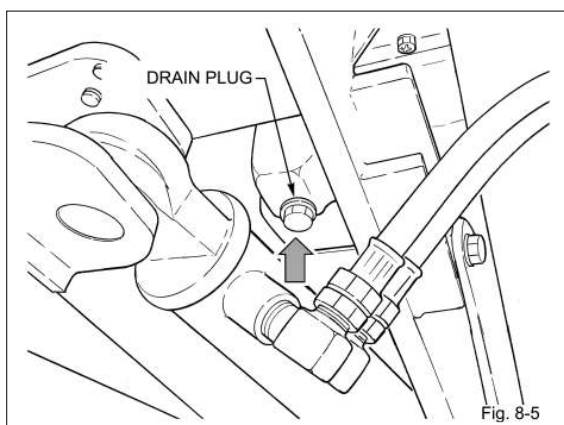


[Caution for Handling]

- Check the oil level before starting the engine or while the engine is cold.
- To check the oil level, place the vehicle on a horizontal place and check while the oil surface is horizontal.
- Never discard waste oil to a river or sewage. Ask a professional to discard the waste oil or take some other appropriate means.

Exchange

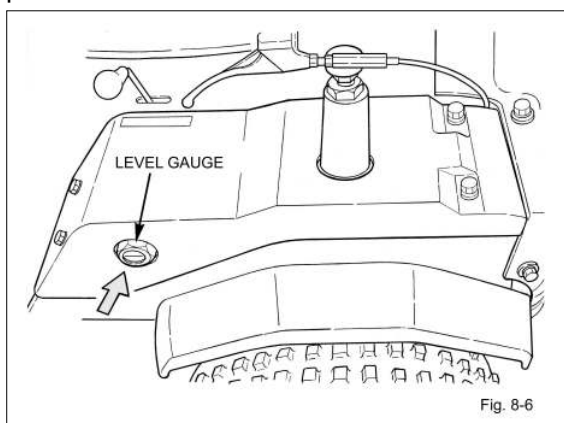
Discharge the oil from the drain plug under the engine. After the oil is completely discharged, tighten the drain plug and fill with new oil from the oil filler port.



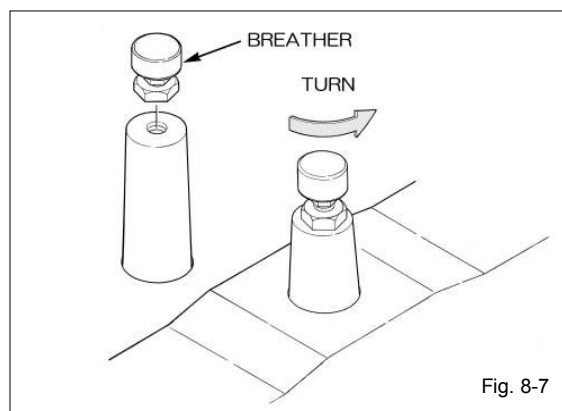
② HST oil

Check

Lower the implement and check the oil level with the level gauge on the hydraulic tank (left side). If the oil level is below the center on the gauge, supply oil up to the specified level ($\frac{1}{2}$ to $\frac{2}{3}$ of the level gauge) from the oil filler port.



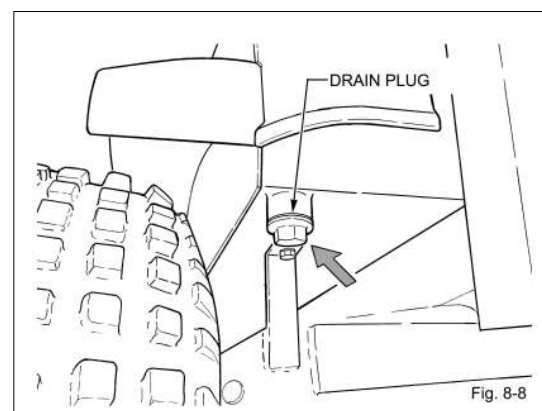
Removing the Oil Breather Port Cap



Turn the breather counterclockwise to remove it. After supplying oil, tighten the breather.

Exchange

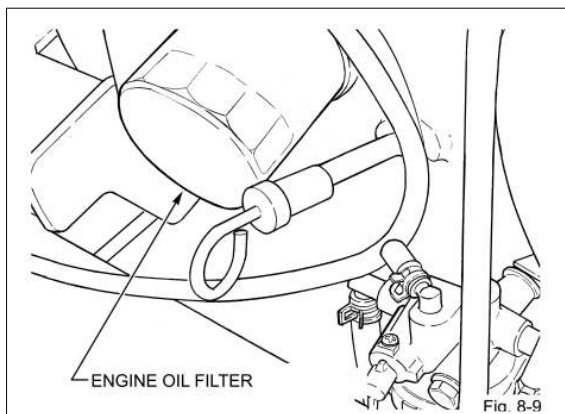
Discharge the oil from the drain plug under the hydraulic oil tank. The oil may be discharged easily while the oil is still warm. (Be careful for hot oil.) After the oil is completely discharged, tighten the drain plug and supply new oil from the oil breather port.



6. Replacing Filters

① Engine Oil Filter

The filter is of the cartridge type. Replace the filter initially after 50 hours and then every 200 hours of operation.

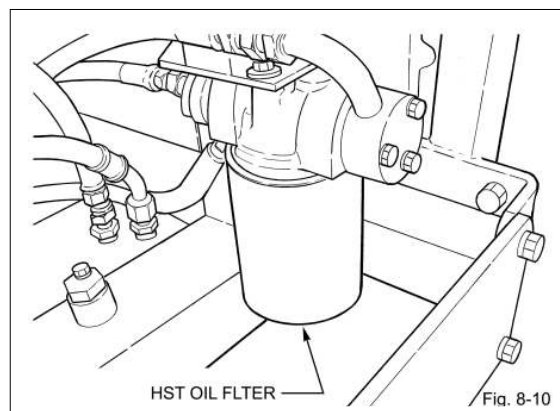


Replacement

- (1) After discharging the engine oil, turn the cartridge counterclockwise to remove it with a filter wrench.
- (2) Coat the rubber ring at the bottom of a new cartridge with a small quantity of oil and install the cartridge firmly by hand.
- (3) After changing the engine oil, start the engine and keep it running until the hydraulic pilot lamp goes out.
- (4) After the engine oil pilot lamp goes out, stop the engine, check the oil level again with the dip stick and replenish if the oil is not enough.

② Oil Filter

The oil filter is of the cartridge type. Replace the oil filter initially after 50 hours and then every 300 hours.



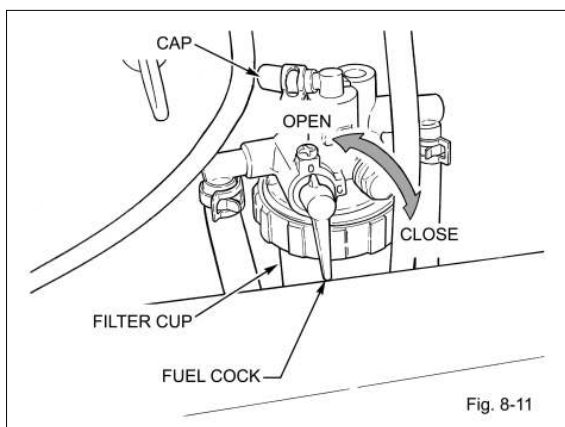
Replacement

- (1) After discharging the hydraulic oil, turn the filter counterclockwise to remove.
- (2) Coat the rubber ring at the bottom of a new filter with a small quantity of oil and install the filter firmly by hand.
- (3) After exchanging the hydraulic oil, idle the engine, check the oil level with the level gauge and replenish if the oil is not enough.

③ Fuel Filter

Cleaning and Replacement

- (1) Turn the fuel tap to the "C" (closed) position.
- (2) Remove the filter cup and remove the water and dust in the filter cup.
- (3) After completion of filter cleaning, install it to the original position and turn the fuel tap to the "O" (opened) position.



The fuel feed pump of this machine is driven from the cam shaft. After it is operated for cleaning or replacement, remove the cap and discharge the air in the filter cup.

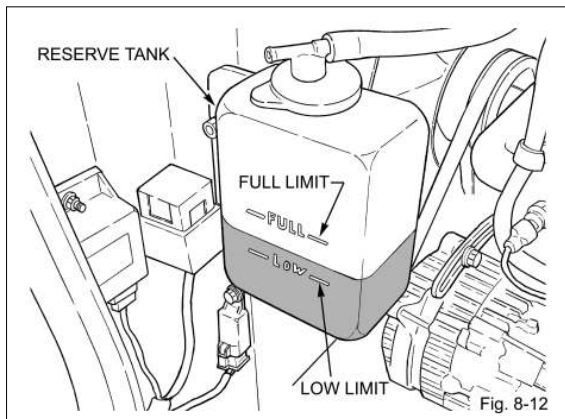
- (4) Replace the fuel filter every 200 hours of operation.

7. Exchanging the Cooling Water



Dangerous

- Do not open the radiator cap while the engine is running or immediately after the engine stops. Open it after the engine stops and has cooled down. If not, hot water may spurt out and you may get burnt.

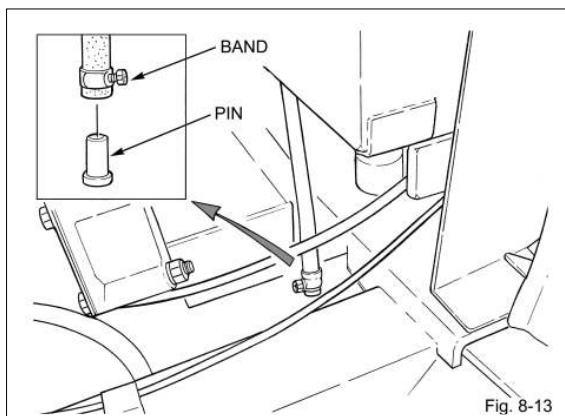


Inspection

Open the bonnet and check that the coolant in the reserve tank is between the upper limit and lower limit. If the level is too low, replenish the coolant from the water feeler port of the reserve tank.

Exchange

- (1) Remove the radiator cap, loosen the band and remove the flat head pin for drain and discharge the water in the radiator completely.



- (2) Wash inside of the radiator with water until no dust or rust comes out.

※ By supplying water containing radiator cleaning agent, running the engine for more than 15 minutes and discharging water, the radiator inside can be cleaned more completely.

- (3) Tighten the drain plug (flat head pin), supply a required quantity of antifreeze and supply fresh water until it overflows.
- (4) Install the radiator cap and start the engine so that the antifreeze liquid and fresh water are well mixed.

<Handling of Antifreeze Liquid>

Antifreeze liquid has an effect to decrease water freezing temperature. The freezing temperature varies depending on the antifreeze liquid mixing ratio. Use the antifreeze liquid at a safe concentration in very cold regions referring to the table below.

Antifreeze liquid mixing ratio at the time of shipment from the plant is set up for the outside air temperature -30°C.

Antifreeze Liquid Mixing Ratio

Ratio	Outside air temperature	-5°C	-10°C	-15°C	-20°C	-25°C	-30°C
Water (%)		82	73	66	61	55	49
Antifreeze liquid (%)		18	27	34	39	45	51

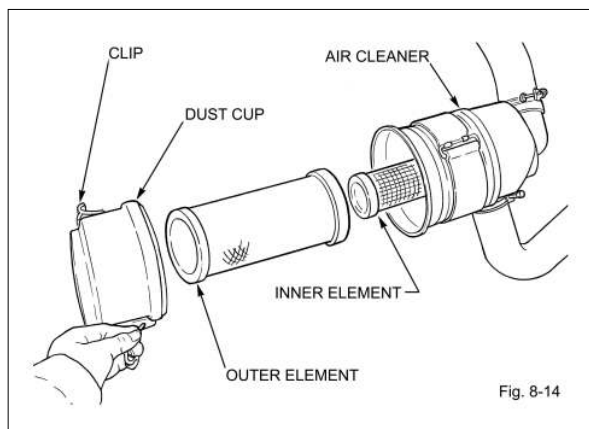
[Caution for Handling]

- When exchanging the cooling water with fresh, be sure to add rust-proof solution in the water and run the engine for 5 minutes to promote mixing of water and solution.
- Mixing ratio varies a little depending on manufacturers. Follow the instructions in the instruction manual of each manufacturer.
- When the cooling water naturally decreases, add only fresh water. (When semi-permanent type is used, measure the specific gravity for confirmation.)
- Life of antifreeze liquid is one year. Change the antifreeze liquid with new one every year.

8. Cleaning and Replacing the Air Cleaner

The air cleaner removes dust contained in supplied air to protect the cylinder and piston ring from wear and keep the engine in good condition for a long time.

The air cleaner is composed of outer and inner elements.



Clean the outer element every 100 hours and replace it after cleaning 6 times. If the operation is carried out in a place subject to excessive dust, clean the air element at a shorter interval. Replace the element about once a year even though the specified interval has not been expired.

Replace the inner element once in every 3 times of replacement of the outer element or every 1000 hours, whichever comes earlier.

Cleaning the Air Cleaner Element

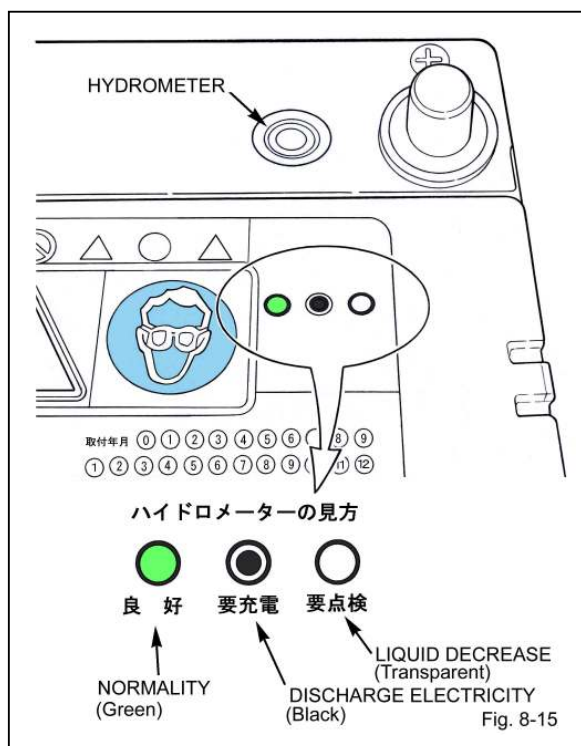
- (1) Open the bonnet.
- (2) Remove the clip, take out the dust cup, blow the air from the inside of the element or shake off the dust. At this time, be careful not to damage the fins.

9. Inspecting the battery

The battery of this vehicle has no vent plug and does not need be replenished with water. (The battery is sealed type without the necessity to replenish water in the overall life.)

When performing inspections or maintenance services, check the battery condition with the hydrometer.

If the hydrometer color is "transparent", electrolyte has reduced and the battery has come to the end of its life. Replace the battery in such a case.



Color which can be seen on the hydrometer indicates the battery condition.

Color on hydrometer	Charging condition	Remedy
Green	Normality	Usable
Black	Discharge Electricity	Auxiliary charge is required.
Transparent	Liquid decrease	End of life. The engine will not be started. Replace the battery.

<Cautions when seeing the hydrometer>

- See the hydrometer when the vehicle is placed horizontally.
- See the hydrometer directly above it.
- If the color on the hydrometer is "transparent" or "pale green", tap the meter to check for air bubbles and see again.



Warning

- When connecting the battery, connect the (+) side first and, when disconnecting it, remove the (-) side first. If not, short circuit and burn injury may result.



Danger

- Avoid fast charging. Battery internal pressure may increase leading to explosion.

< Perform the procedure below while the color on the hydrometer is black.>

When the vehicle is operated in a cold district or any other places where the atmospheric temperature is low, engine is difficult to start, or starter does not start because of self-discharge, perform the auxiliary charge in the following procedure.

1. Remove the battery.
2. Connect the (+) side of the battery to the (+) side of the charger and the (-) side of the battery to the (-) side of the charger.
3. Charge the battery at about 3 amperes for 8 to 10 hours. When the color on the hydrometer is changed to green, charging is completed.
4. Install the battery to the vehicle.

10. Inspection of Pipes



Danger

- Check the fuel pipe, radiator hose, and power steering hose for damage and leakage of fuel, oil or water and check the clamps for looseness. Replace them every 2 years even if not damaged.

11. Inspecting Electric Wires

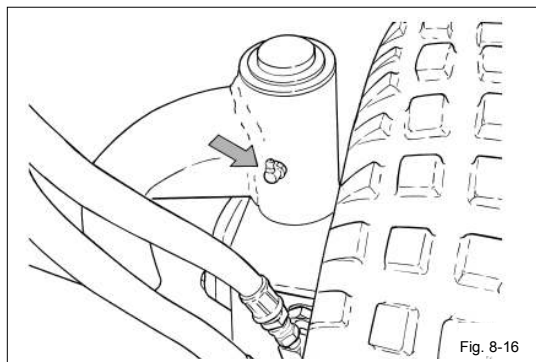


Warning

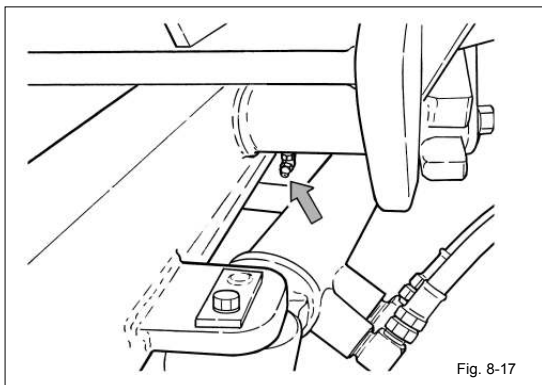
- Check the code for contact with other parts, separation of sheathing, or loosened connections every day before operation.
- Remove grass or dust attached to the battery or wiring cleanly before and after operation. If not, short-circuit or fire may be caused.

12. Greasing (Injection)

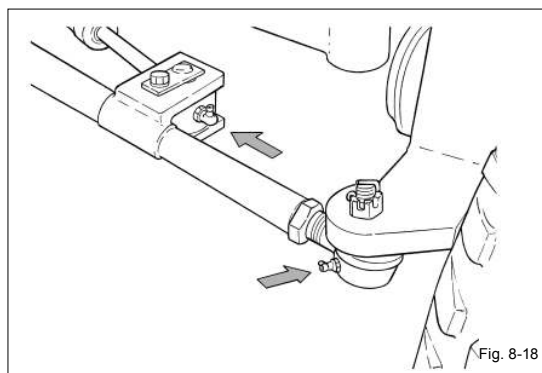
Check the grease every 50 hours. Before starting work, check the grease at each point and replenish if required.



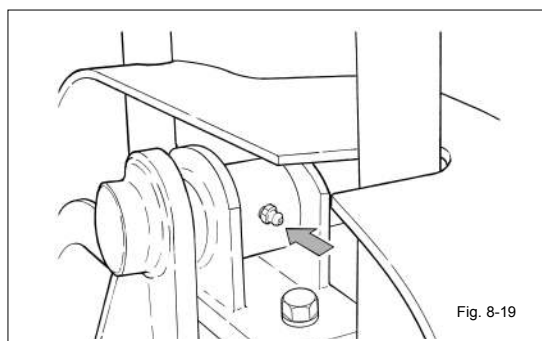
King pin



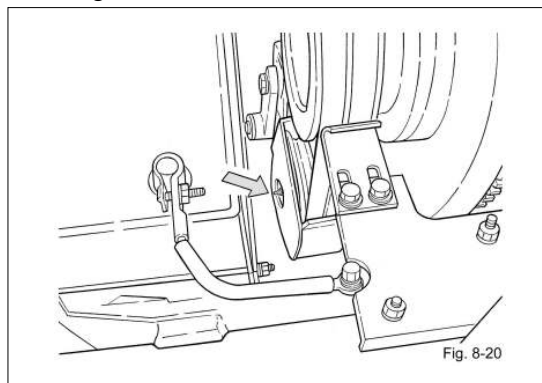
Front wheel pivot shaft



Power steering cylinder (at 2 points), tie rod end (2 points)



Rolling seat



PTO shaft (front end)

13. Inspecting and Adjusting the Fan Belt

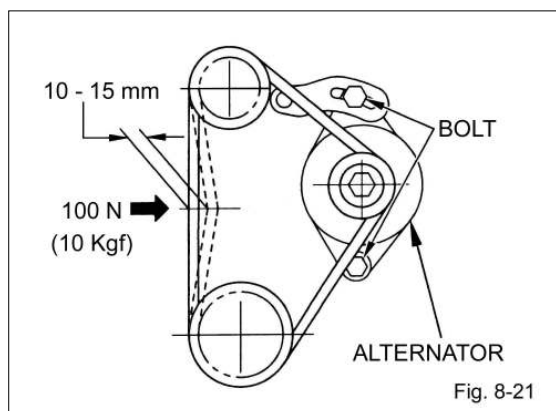


Caution

- Be sure to stop the engine.
- Inspect and adjust the fan belt after the engine has completely cooled down. If not, you may get burnt.

Open the bonnet, push an intermediate point of the fan belt by a force of about 100N (10kgf) and check that the deflection of the belt is about 10 to 15mm and check for damage of the belt.

If the deflection is not correct, loosen the alternator tightening bolt and adjust the tension by moving the alternator. If the belt slips after the alternator is moved, replace the belt with new one.



14. Cleaning the Radiator



Caution

- Remove dust or grass deposited or entangled on the inside. Remove grass and other dust deposited around the V belt or engine frequently. If not, a fire may be caused.

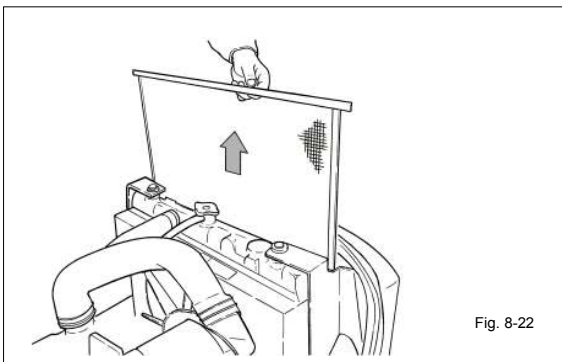


Fig. 8-22

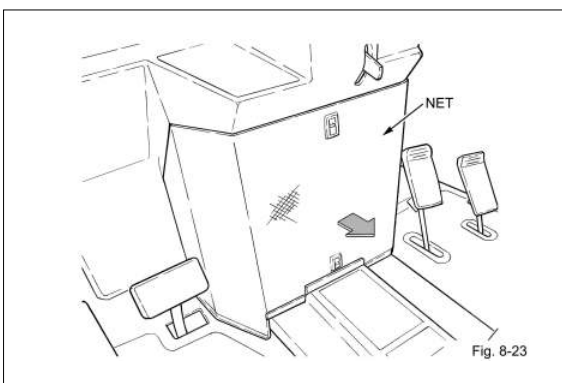


Fig. 8-23

- (1) Open the bonnet.
- (2) Pull out the radiator screen upward.
- (3) Remove mowed grass or other dust. Clean away the dust attached to the radiator taking care not to damage the fins.
- (4) Remove the net and discharge dust under the radiator.

Grass and other dust attached to the radiator may cause overheat. Always check and clean before and after operation. Check even during operation depending on the operating conditions. If grass or dust attaches to the lower part of the dash board or cooling air suction net under the dash board, stop the machine and remove it otherwise an overheat may be caused.

15. Inspection and Replacement of Fuse and Slow Blow Fuse

Remove the cover of the fuse and check the fuse.

Stop the engine and check the slow blow fuse. If the fuse blows out, replace with new one of specified capacity.

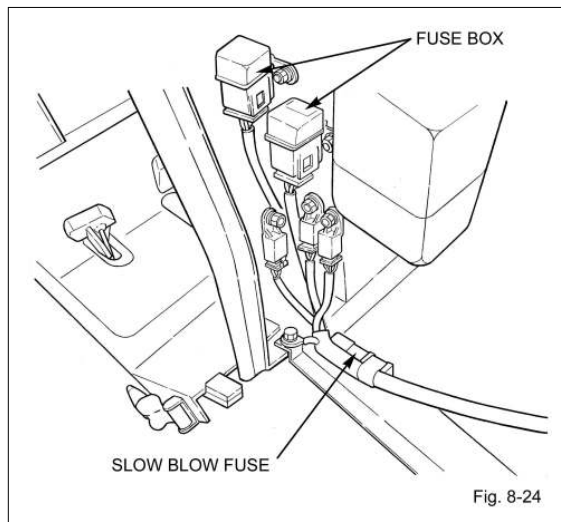
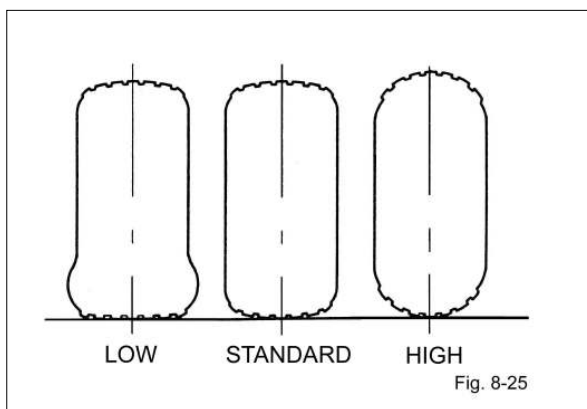


Fig. 8-24

16. Inspecting the Tire

① Inspection of Tire

Check the tires of the front and rear wheels for proper air pressure. It can be visually checked as illustrated below.



Standard air pressure

	Tire size	Air pressure kPa (kgf/cm ²)
Front wheel	21×11.00-10-PR	68 (0.7)
Rear wheel	21×11.00-10-PR	68 (0.7)

Check the tire for damage or crack.

② Inspection of wheel fixing bolt

Check each wheel fixing bolt for looseness. If looseness is noticed, retighten referring to the values in the table below.

Wheel	Tightening torque Nm (kgf·cm)
Front	81.3 ± 9 (810 ± 90)
Rear	81.3 ± 9 (810 ± 90)

17. Color of Exhaust Gas

When the engine is started, a small amount of black exhaust gas is emitted but usually exhaust gas is colorless.

Black: ...Imperfect combustion because of too rich fuel

White: ...Engine oil is burning. When the air temperature is low, exhaust gas may look white because of steam.

If black or white exhaust gas is emitted without load, subject the vehicle to service at a dealer.

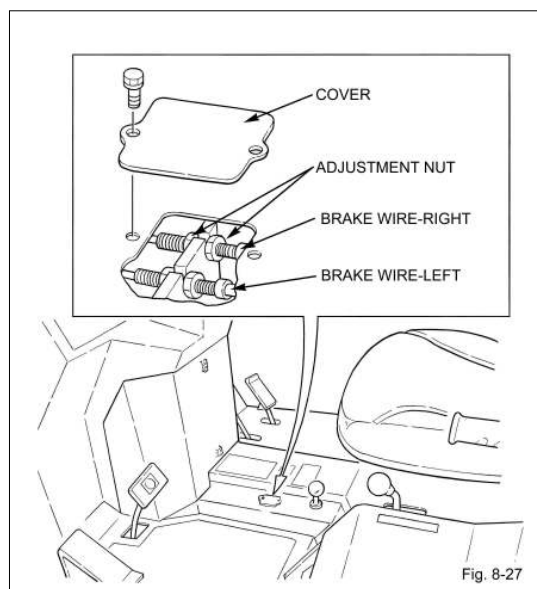
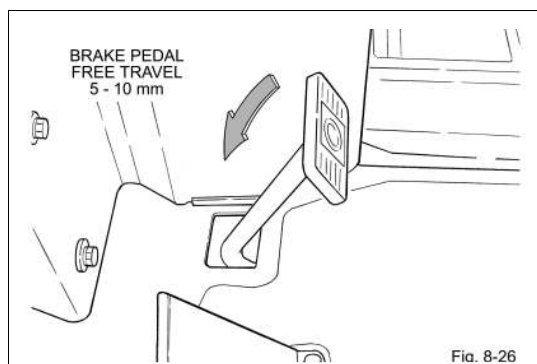
18. Inspection and Adjustment of Brake

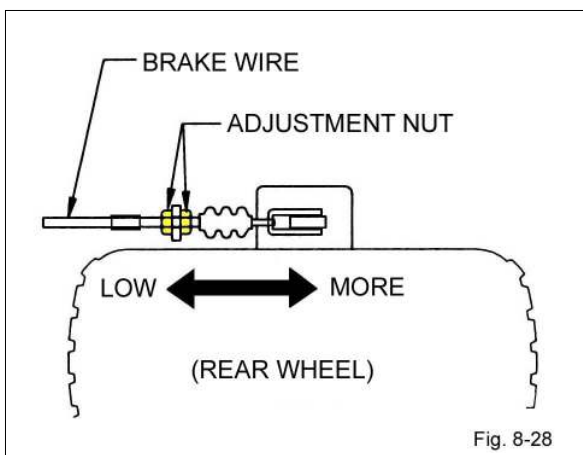


Warning

- Check the brake for correct operation. If not, an accident may be caused.

Press the brake pedal and check for specified allowance (5 – 10mm) and same functioning on the right and left sides. If the allowance of the pedal is not as specified, remove the step cover and adjust with the cable from the rear wheel traveling section. If adjustment cannot be completed at this point, remove the rear wheel and adjust the adjusting point on the inside of the rear wheel. Check that the parking brake is properly applied with the parking brake lever.





19. Inspection and Adjustment of Clutch Belt

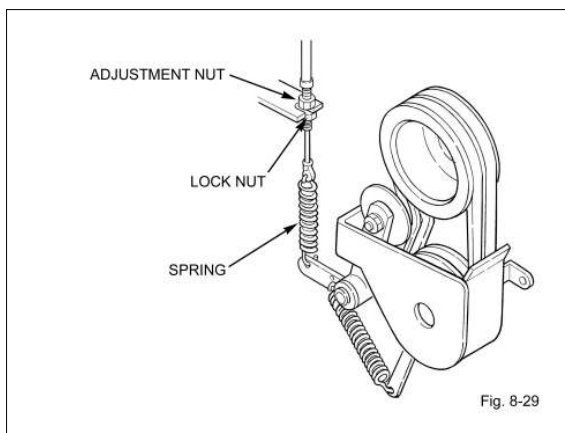


Warning

- Before starting the inspection and adjustment, be sure to stop the engine, apply the parking brake, pull out the key and set the mower clutch lever to "OFF". If not, you may be injured.

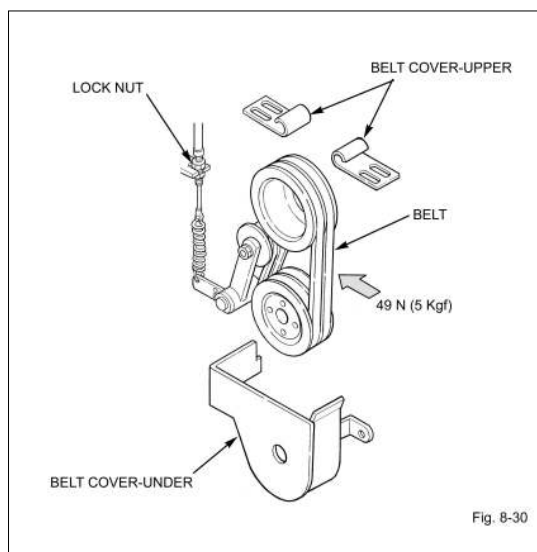
① Inspection of belt

- Open the bonnet.
- Check the belt for wear and damage.



② Adjustment of belt tension

- Open the bonnet.
- Set the mower clutch lever to the "ON" position and adjust the belt tension.
Proper belt tension is such that the approximate center is deflected 5mm when pressed by a force of 49N (5kgf). Adjust the tension properly in the procedure below.
- Loosen the tension wire lock nut and adjust the wire length.
- After the belt tension is properly adjusted, tighten the lock nut.



③ Inspection of belt

- Open the bonnet.
- Set the mower clutch lever to the "OFF" position.
- Remove the upper and lower belt covers.
- Replace the belt and adjust the belt tension as described above.

[Caution for Handling]

- When replacing the belt, replace both at the same time.

SECTION 9-TROUBLE SHOOTING



Warning

- Refer to following chart if you find the machine not working correctly. Stop the engine first before start inspection.

1. Engine related condition

Condition	Check Point	Remedy
Starter does not rotate when the key switch is turned.	Safety switch may be functioning.	Set the PTO lever to "OFF", release your foot from the traveling pedal, and turn the key switch pressing the brake pedal.
	Level of battery electrolyte or battery discharge	Replenish the battery electrolyte to the specified level and charge the battery fully.
	Looseness or corrosion of battery terminals	Clean and tighten the terminals firmly. Apply grease to prevent rust.
	Blowout of fuse	Replace the fuse with new one.
	Failure of switch	Subject to repair or replace at a service plant.
	Failure of starter motor	Subject to repair or replace at a service plant.
Starter rotates but the engine does not start.	Fuel level in the fuel tank	Replenish the fuel.
	Air mixed in the fuel	Check the fuel pipe from the fuel tank to injection pump.
	Fuel tap may be at the "C" (close) position.	Set the fuel tap to the "O" (open) position.
	Key stop solenoid harness may be dislocated.	Connect the harness firmly.
Engine rotates irregularly.	Air may be mixed in the fuel.	Check the fuel pipe from the fuel tank to injection pump.
	Water may be mixed in the fuel.	Discharge water and change the fuel with light oil.
	Clogging of injection nozzle	Repair or replace.
	Clogging of fuel filter	Wash or replace.
Overheated engine	Insufficient cooling water	Replenish the cooling water.
	Loosened or damaged fan belt	Adjust the tension or replace the belt.
	Clogging of radiator fin	Wash or replace.
	Insufficient engine oil	Replenish the oil.
	Overload operation	Reduce the load.
Engine is running with low power.	Clogging of air cleaner	Inspect and clean the air cleaner.
	Seized nozzle	Subject to repair by a service plant.
	Insufficient compression pressure	
	Improperly adjusted valve clearance	

TROUBLE SHOOTING

Condition	Inspection Point	Remedy
White smoke emitted from the muffler	Excessive engine oil	Discharge excessive oil.
	Too low viscosity of engine oil	Change the oil to one of proper viscosity.
Engine oil lamp lights up while driving	Decreased engine oil	Replenish the oil to specified level.
	Too low engine oil viscosity	Change the oil to one of proper viscosity.
	Failed pressure switch	Replace the switch.
	Failed oil pump	Subject to repair by a service dealer.
Charging lamp lights up while driving.	Failure of alternator	Subject to repair by a service dealer.
	Looseness or damage of fan belt	Adjust the belt tension or replace the belt.

2. Brake System

Condition	Inspection Point	Remedy
Ineffective or pulling brake	Free-play of brake pedal	Adjust the free-play of pedal.
Unsmooth return of brake pedal or sticking brake	Failed brake return spring	Replace the spring.

3. Hydraulic System

Condition	Inspection Point	Remedy
Implement will not raise.	Insufficient HST oil	Replenish to specified level.
	Air being sucked into the intake pipe.	Retighten the oil filter or mounting point.
		Replace cracked pipe or damaged O rings, if any.
	Clogging of oil filter	Replace the oil filter.
	Failure of HST pump	Subject to repair by a service dealer.
	Dust caught in the control valve or main valve. Failure of O ring.	Subject to repair by a service dealer.
Implement will not lower.	Failure of cylinder	Subject to repair by a service dealer.
	Dust caught in the control valve or main valve.	Subject to repair by a service dealer.
		Subject to repair by a service dealer.

TROUBLE SHOOTING

4. Electric System

Condition	Inspection Point	Remedy
Lamp does not light up.	Burnt-out light bulb	Replace the light bulb.
	Blown fuse	Replace the fuse.
	Improper connection of wiring	Inspect and connect firmly.
	Failed switch	Replace the switch.
	Improper earthing	Tighten the earth wire firmly to the main body.
	Discharged battery	Charge.

SECTION 10-CONSUMABLE PARTS

1. Main consumable parts

Engine system

Part code	Name	Q'ty/unit	Remarks
08010 9061	Fan belt	1	Type A, 36.5 inches
14051 7020	Engine oil filter	1	
36072 0130	Fuel filter	1	

Hydraulic, air cleaner and belt related parts

Part code	Name	Q'ty/unit	Remarks
T46600872	Oil filter: HST	1	
34050 0780	Oil filter: HST	1	
31453 1176	Air cleaner: In	1	For inner use
31453 1177	Air cleaner: Out	1	For outer use
A9866 0230	V belt: Clutch	2	W800 SB36

Electric components

Part code	Name	Q'ty/unit	Remarks
38541 0330	Slow blow fuse: 50A	1	
38562 0220	Connector: diode	2	
38541 0070	Fuse: 5A	3	
38541 0200	Fuse: 30A	1	
38512 0030	Bulb	4	Pilot lamp bulb

2. Standard accessories

	Name	Q'ty/unit	Remarks
Instruction manual	(A0081 0670)	1	
Assembly manual	(A0087 0160)	1	

SPECIFICATIONS

3. Specifications

Vehicle

Vehicle body size	Model		SG280E		
	Overall length mm		2525		
	Overall width mm		1580		
	Overall height mm		1200 (handle) /1900 (ROPS)		
	Tread mm		1500		
	Tread	Front wheel mm	1310		
		Rear wheel mm	1310		
	Ground clearance mm		Reference clearance 140 (lower side of mower deck)		
Wheel	Front wheel size		21×11.00×10		
	Rear wheel size		21×11.00×10		
Engine	Model		SHIBAURA N843		
	Type		3 cylinders, water cooled 4 cycle Diesel engine		
	No. of cylinders		3		
	Displacement cc		1496		
	Rated output kw(HP)/rpm		20.6(27.6)/2400		
Vehicle body	Drive		2WD/4WD		
	Transmission		HST		
	Brake		Internal expanding type		
	P.T.O. clutch		Belt tension		
	Speed	Forward	2WD km/h	0 – 18	
			4WD km/h	0 – 9	
		Reverse	2WD km/h	0 – 12	
			4WD km/h	0 – 6	
	Weight kg (vehicle)		800		
Capacity	Fuel tank capacity liter		26		
	Hydraulic oil capacity liter		23		
	Engine oil liter		3.5		
	Radiator liter		4		
	Battery		55B24L		
Vibration* ¹	Arm		Below 2.5 m/s ²		
	Body		0.3 m/ s ²		
Noise* ²	Sound levels at operator's Ear		83 dB(A)		

*1 Vibration evaluated based on EN836 (Annex G).

*2 Stand-alone machine, maximum engine speed, PTO-OFF.

ELECTRICAL DIAGRAM

4. Wiring Diagram

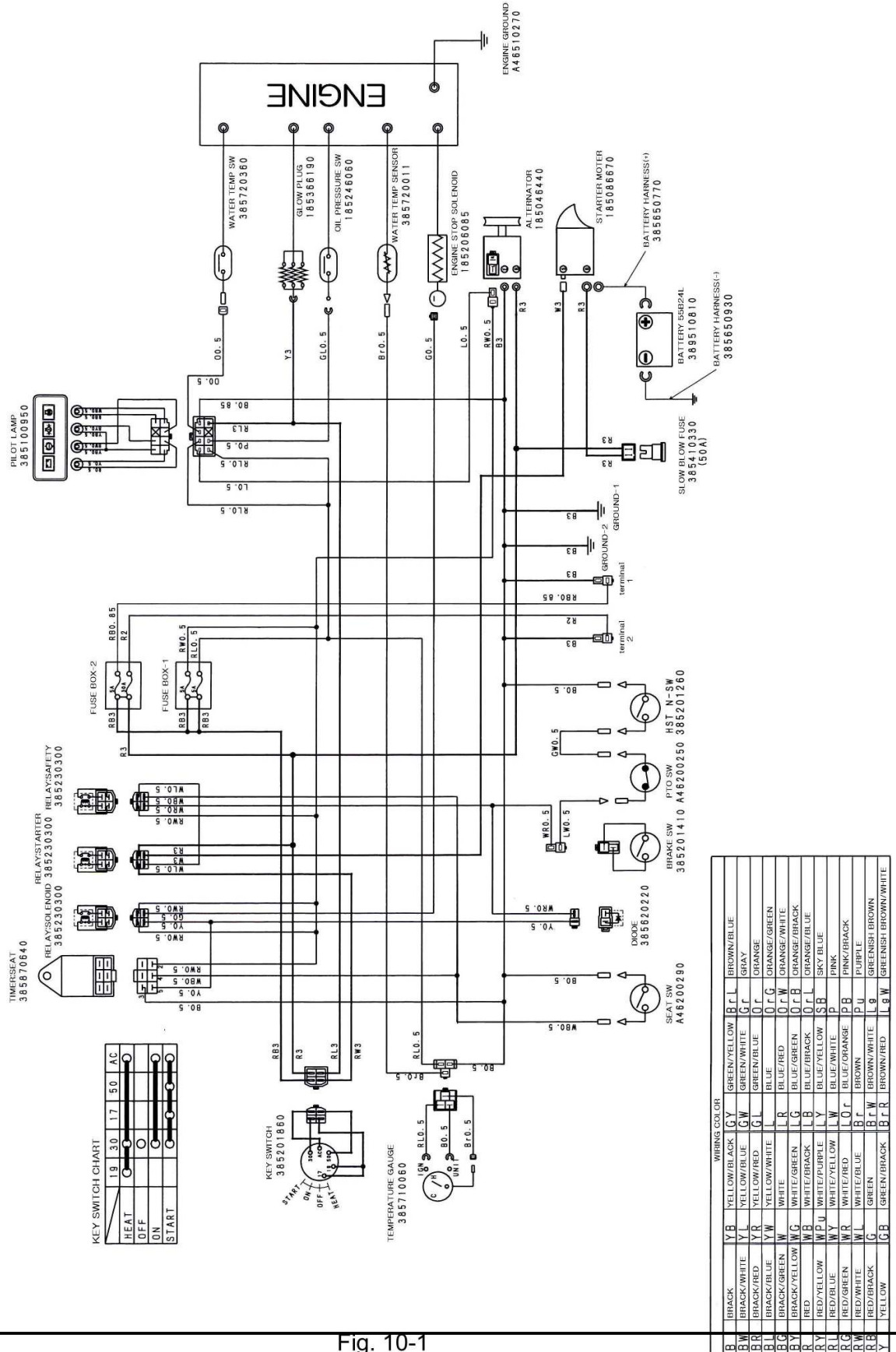


Fig. 10-1

TIGHTENING TORQUES

5. Tightening Torque List

[Hydraulic Hose and Pipe]

Tightening hose union nut tightening torque

Nominal size	G1/4	G3/8	G1/2
N·m	24.5	49	58.8
kgf·m	2.5	5.0	6.0

Adaptor (with O-ring) lock nut tightening torque

Nominal size	G1/4	G3/8	G1/2
N·m	39.2	49	58.8
kgf·m	4.0	5.0	6.0

R screw tightening torque

Nominal	1/8	1/4	3/8	1/2	3/4
N·m	21.6	35.3	53.9	84.3	127
kgf·m	2.2	3.6	5.5	8.6	13.0



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